SUPREME COURT OF THE UNITED STATES,

No. 2.

The Keystone Bridge Company, Appellant,

vs.

The Phœnix Iron Co. et al., Appellees.

APPEAL

FROM THE

CIRCUIT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

BRIEF FOR APPELLANT.

HENRY BALDWIN, Jr.,

Of Counsel for Appellant.

Supreme Court of the United States.

THE KEYSTONE BRIDGE COMPANY, *Appellant.*
vs.
THE PHŒNIX IRON COMPANY ET AL. *Appellees.*

APPEAL FROM U. S. C. C., EAST'N DIST. PENNA.

BRIEF FOR APPELLANT.

I.

STATEMENT OF THE CASE.

The appellant filed its bill in the Court below to restrain the infringement by the appellees of two several letters patent, the exclusive rights under which had become vested in the appellant by assignments from the patentees.

Appellant's title is admitted.

Record, p. 71.

The patents are No. 34,183, granted to J. H. Linville, assignor to himself and John L. Piper, under date of January 14th, 1862, for improvement in iron truss bridges, and No. 50,723, granted to J. H. Linville and John L. Piper, under date of October 31st, 1865, for improvement in wrought-iron bridges.

The bill states that the complainant corporation is largely

engaged in the business of manufacturing, building, and constructing iron bridges for railway and other uses, and that the inventions secured by the respective letters patent mentioned are of great value and importance in the construction of iron truss bridges and other structures to bear heavy weights, and have been extensively introduced by complainant, who has erected costly machinery and invested a very large amount of capital for the purpose of manufacturing and constructing in accordance with said patents, which have now become well known, and are recognized as founded upon true principles, and embodying almost indispensable requisites for the safe construction of bridges over which great weights are intended to be passed; or of other structures designed to bear heavy weights.

And the bill charges that:

"The said defendants are infringing upon the rights of com-
"plainants *by using and employing the inventions which are se-*
"*cured to complainants by the aforesaid letters patent, and are*
"*offering to construct bridges, and to manufacture, at their works*
"*at Phœnixville, in the State of Pennsylvania*, posts for wrought-
"iron truss-frames, to be employed in the construction of
"bridges such as are substantially identical with those de-
"scribed in the second claim of the said Letters Patent
"No. 34,183, bearing date January 14th, 1862.

"And in the first claim of the said Letters Patent No. 50,723,
"bearing date October 31st, A.D. 1865.

"Also by the construction of the upper chords or compres-
"sion-beams, formed by a combination of 'I' shaped rolled
"beams or channel-bars riveted to plates of wrought-iron so as
"to form in each chord a series of rectangular tubes or cells, in-
"tended thus to secure great transverse strength to support the
"weight of passing trains of railroad cars or other heavy
"weights, combined with great resistance to compressive force,
"substantially such as are described in the said Letters Patent
"No. 50,723.

"*Also by the construction of the lower chords of truss-frames*
"*for bridges* out of wide and thin-rolled bars of wrought-iron,
"the eye end of which is enlarged, and is formed by upsetting
"the iron, when intensely heated by compression, into moulds

"of the required shape, for the purpose of increasing the "density, toughness, and strength of the eye of the rod, and of "enlarging the eye without diminishing the transverse section, "*substantially such as is described in the first claim of the said* "*Letters Patent No.* 34,183, *bearing date January* 14*th*, A.D. 1862.

"*And in the third claim of the said Letters Patent No.* 50,723, "*bearing date October* 31*st*, A.D. 1865."

Record, pp. 1, 2.

In their answer the defendants respond to this charge of infringement as follows:

"And these respondents further answering, say that they "deny it to be true, as in the said bill alleged, that these re- "spondents are infringing upon the rights of the complainants "by using and employing the alleged improvements mentioned "and described in said letters patent in said bill mentioned; on "the contrary thereof, *these respondents say that their mode of* "*making and constructing bridges, posts, and truss-frames, and* "*the parts and appurtenances thereof*, is in all substantial and ma- "terial respects different from that described and claimed in said "letters patent of the said Jacob H. Linville and John L. Piper "(except so far forth as said mode is derived from the prior "letters patent of the said Samuel J. Reeves and George H. "Sellers, as hereinbefore mentioned, or from prior publications), "and is in no wise, either in fact or in law, as they are advised, "and as they believe, an infringement or a violation of any right "validly secured thereby to the said patentees, or vested in the "said complainants."

Record, p. 5.

In support of the charges of infringement the complainant below proved by J. H. Linville the following facts:

Q. 22. What do you know relative to the use by the defendants of lower chords for iron bridges? State, if you know, the combination in which the same are employed and the process by which made, and wherein, in such particulars, the same resemble or differ from the lower chords, combined and made as described in your patents of 1862 and 1865 respectively.

A. I saw the bases of the posts as constructed by the Phœnix Iron Company, and intended for the La Salle bridge, in Illinois

These bases had ribs projecting downwards for the insertion of the lower chords, the ends of the chords being intended to be inserted between the same and fastened, all the same substantially as described in our patent of January, 1862. I saw at the same time the eye-bars which were intended for insertion between these ribs, and the same had enlarged ends which had been formed by upsetting the iron, when heated, by compression into moulds corresponding in shape to the ends of the chords, for the purpose of increasing their densities, substantially as described in our patent of 1865. I think it was about two years ago that I saw these chords.

(The date of Mr. Linville's deposition is March, 1870; so it was in 1868 that he saw these bases and chords or eye-bars.)

Q. 23. How do you know that the Phœnix Iron Company made these bases and chords, and how do you know that the chords were made by the upsetting process?

A. The bridge was being built, to my knowledge, by Charles Kellogg, of the firm of Kellogg & Clark, bridge-builders; and I have knowledge, from Mr. Reeves' conversations and admissions in my office, that the iron-work of them was made by the Phœnix Iron Company. I think also that some of the pieces that I saw had the mark of the Phœnix Iron Company on them. The opinion expressed as to the manner in which the lower chords were made—that is, by upsetting—was derived from the inspection of the ends and from my knowledge of the appearance and the marks of the mould on chords so made.

Q. 24. Have you read, and do you understand, the description of the process of upsetting chords as practised by defendants, as testified to by Samuel J. Reeves (answer to *Question* 36 of his testimony); and if so, state wherein, if at all, such process differs from that described in your patent of 1865?

A. I have read the testimony of Mr. Reeves referred to, and think there is no substantial difference between the defendants' process therein described and as described in our patent of 1865. In our patent we describe the enlarging or upsetting the ends of the chords by compressing them into the desired shape in moulds, into which the heated iron is forced under immense pressure. According to the testimony of Mr. Reeves,

the process of the defendants contemplates the heating of the end to be upset or enlarged, and placing this end in a die or mould which is larger than the desired thickness of the chord; pressure is then applied to the chord until its end is made to fill the die or mould; it is then removed, reheated, and placed in another mould or die, which is of the width required for the end when finished; pressure is then applied to this die, and by means of this pressure the heated end is spread or enlarged so as to fill the die or mould. The object sought to be obtained in both is the enlargement of the end so as to permit the holes or eyes for the pins to be made without reducing the transverse sections of the ends of the chord to a less area than that of the body of the chord, and of so accomplishing this by means of pressure as to increase the density and toughness of the metal. Mr. Reeves has not described the means of applying the pressure in the machine used by them, nor the manner by which the box of the machine holding the dies is bound together; but while in such respects there may be a difference between the methods of applying the pressure as practised by them from the mode as practised by us, yet in both cases the chords are formed under pressure, and so the chords and the method of upsetting them are, in my opinion, substantially the same.

Record, pp. 58, 59, and p. 82 (Reeves), A. 36.

And the following further facts appear in the evidence:

September 12th, 1870.

Present, Mr. McMurtrie, Mr. Collier.

Cross-examination of Mr. Bonzano (defendants' witness).

× *Q.* 16. Are you engaged at this time in the construction of iron bridges; if so, by whom are you engaged?

A. I am a partner of the firm of Kellogg, Clark & Co., and I act as engineer, designer, calculator, and constructor; that firm is engaged in the construction of iron bridges.

× *Q.* 17. From whom does said firm obtain its iron?

A. At present the firm obtains all its material from the Phœnix Iron Company.

× *Q.* 18. For how long have you been thus engaged as engineer, designer, etc., for that firm?

A. I have been in the firm of Kellogg, Clark & Co., engaged in that capacity, for the past ten years and a half.

× *Q.* 19. During that period of time has said firm obtained all its iron from the Phœnix Iron Company?

A. Yes.

Record, pp. 126, 127.

The cause was heard upon pleadings and proofs, and the Court below dismissed the bill upon the following grounds as respects the subject-matter of this appeal:

"The first claim of the patent of 1862 is for the construction "of the lower chords of truss bridges of series of eye-bars, "wide- and thin-drilled eye-bars, applied on edge between ribs "on the bottom of the posts, etc. The form of the bars is of "the essence of the claim,—*wide* and *thin* bars only are claimed, "—and, as the only proof of infringement is that the respond- "ents made eye-bars *round* in section, which were used in the "La Salle bridge, to perform the functions of tension chords, the "patent of 1862 may be dismissed from further consideration."

"The third claim in the patent of 1865 is for 'the use, for "'the lower chords of truss-frames, of wide and thin rolled "'bars, with enlarged ends formed by upsetting the iron when "'heated by compression into moulds of the required shape.' "As the respondents are proved to have made only *round* "chord-bars, which were used in the La Salle structure, it may "well be doubted that they have infringed this claim; and "especially as they are not employed or adapted to give ver- "tical support to the roadway, which is an important function "of the complainant's lower chords, and is the reason of their "peculiar conformation. But waiving this, and assuming that "the enlarged ends of the respondent's chord-bars are formed "as described in the claim, it is not to be doubted that the "patent is limited to the *use* of the chords in bridge struc- "tures. This is distinctly set forth in the specification, where "it is stated that 'we do not claim the upsetting of bars in "'the manner described, nor any peculiar mode of performing "'the operation, but merely the *use* of chord-bars for bridges, "'the ties of which are thus formed so as to give additional "'strength to the bar where it is so much needed.' The ex-

"clusive right to make chord-bars in any mode is distinctly "disclaimed; only their use, when formed as described, is "appropriated by the patentees and forbidden to others. They "in effect declare that any one may lawfully make the bars, "and that no encroachment upon their rights is committed "until the bars are used by being put into a bridge.

"Now, the respondents are iron manufacturers, and it is shown "that the bridge at La Salle, Illinois, was built by Kellogg & Clark, "who obtained the iron for it from the respondents, and that the "bottom chords used in it were like those claimed by the complain- "ants. This is all the proof of infringement, and I think it falls far "short of fixing any accountability upon the respondents. They "made the bars, but did not use them,—Kellogg & Clark did that. "They did only what they had a legal right to do, and did not "thereby assume any responsibility for the wrongful acts, or be- "come involved in the unlawful purposes of others. Nor can this "responsibility be imposed upon them, because privity with a wrong- "doer is not necessarily to be inferred from the exercise of a legal "right.

* * * * * * * * * *

"By clear implication, the patentees have authorized the re- "spondents to make and sell the chord-bars described in their "patent, and have declared that only those who use them as "lower chords in bridge construction can be called to account "for infringement. Having, therefore, exercised the conceded "rights of manufacturers only, the respondents cannot, by any "strained inferences, be implicated in the wrongful acts of "others.

"The bill must, therefore, be dismissed with costs."

The questions thus raised involve:

I. The construction of the first claim of appellant's patent (No. 34,183) of 1862.

II. The construction of the third claim of appellant's patent (No. 50,723) of 1865.

III. The gravamen of infringement upon letters patent of the United States.

Copies of the patents of 1862 and 1865 are annexed hereto, and the opinion of the Circuit Court is printed at the end of this Brief.

II.

ASSIGNMENT OF ERRORS.

1. The Court below erred in its construction of the first claim of the patent of 1862.

2. The Court below erred in its construction of the third claim of the patent of 1865.

3. The Court below erred in finding that the defendants had not infringed either the first claim of the patent of 1862 or the third claim of the patent of 1865.

4. The Court below erred in dismissing complainants' bill.

III.

BRIEF OF THE ARGUMENT.

I.

THE FIRST CLAIM OF THE PATENT OF 1862.

The specification of this patent declares the invention to consist, first, in a novel construction of the lower chords and mode of applying the same, in combination with the posts and other parts of the truss, and it gives the following particulars as to this branch of the improvements:

The bottom chords C, C, are each composed of a series of wide, thin eye-bars of wrought-iron, of a length corresponding with the distances between the posts on one side of the truss, placed on edge to enable them to give vertical support to the roadway, and fitted outside of the bases L, L, of the posts, and between ribs S, S, formed on the said bases, as shown in Figs. 2 and 4.

The bars C are extended in width at their ends, and drilled to receive connecting-pins P, P, one at the base of each post, the said pins passing through the said ribs S, S, and being supported by the suspension bars D, D, which, as well as the counter-diagonals, E, E, are also fitted between other and similar ribs, S, S, the lower ends of the said bars being made with eyes for the reception of the said pins.

The said chords, the ribs S, S, and the diagonal rods D, D, and E, are so disposed or distributed as to obviate all danger of bending the connecting-pins P, P, which can only yield by being sheared off by the tensile strain on the chords and diagonals; and the chords being thus well supported at short intervals, support the floor-beams and track without the employment of auxiliary beams for this purpose.

The lower lateral tension braces H, H, consist of short rods connected (as shown in Fig. 4) midway between the two trusses, with a ring A^1, and also connected with plates N, N, through which the connecting-pins P, P, of the lower chords pass, the said plates being interposed between the lower chords and the ends of the cast-iron struts I, I, and being secured to the lower chords and bosses of the posts by means of the nuts on the outer ends of the said pins P, P. The said rods may be either tapped into the ends of the plates N, N, as represented, or attached by eyes. The lateral struts have each a concave opening in the lower parts of their ends to drop over the connecting-pin, and they should bear upon the plates N, N.

These plates transmit the strain from the rods H, H, to the struts I, I, without straining the ribs S, S, of the bases of the posts.

The summing up of the specification is as follows: I do not claim the use of eye-bars or links as chains of suspension bridges, or as tension-braces of truss bridges; but what I claim as my invention and desire to secure by letters patent is, 1st, The construction of the lower chords of truss bridges, of series of wide- and thin-drilled eye-bars C, C, applied on edge between ribs S, S, on the bottoms of the posts, and connected by pins P, P, supported in the diagonal tension-braces D, D, and E, all substantially as herein described.

The sole defence urged below in respect to this claim was that the defendants had never made any wide and thin eye-bars, and therefore had not infringed.

The Circuit Court very briefly dismissed the question in this behalf with the following statement:

"The first claim of the patent of 1862 is for the construc-
"tion of the lower chords of truss bridges, of series of eye-bars,

"wide- and thin-drilled eye-bars, applied on edge between ribs "on the bottom of the posts, etc. The form of the bars is of "the essence of the claim (wide and thin bars only are claimed), "and as the only proof of infringement is that the respondents "made eye-bars round in section, which were used in the La "Salle bridge to perform the functions of tension chords, the "patent of 1862 may be dismissed from further consideration."

It is respectfully submitted that this construction of this claim was erroneous.

The first claim of the patent of 1862 is not for eye-bars nor for the use of eye-bars; such a general claim being specifically repudiated in the summing up of the specification; but the claim is for *a lower chord of a truss bridge, constructed of a series of wide- and thin-drilled eye-bars, applied on edge between ribs on the bottom of the post, and connected by pins supported in the diagonal tension-braces, all substantially as described.*

The parts constituting this lower chord are adapted to each other and combined for special purposes, set forth in the specification, which declares the invention to consist in *a novel construction of the lower chords, and mode of applying the same in combination with the posts and other parts of the truss.*

The bottom chords are composed of series of wide and thin bars placed on edge to give vertical support to the roadway, and these bars are *extended in width at their ends* and drilled to receive the connecting-pins.

Moreover, the series of these wide- and thin-drilled ends or eyes are fitted outside of the bases of the posts, and between ribs formed in those bases; the bars and bases being mutually adapted to this new combination, and coincidently opened for the proper reception of the connecting-pin, and for the support of the connecting-pin not only at its ends outside of the post, but also intermediately within the post, in and between the ribs and eye-bars alternately.

The bases of the posts are of novel construction, adapted to the novel mode of applying the wide- and thin-drilled eye-bars on edge and between the ribs on the base of the post as well as on the outside, and these ribs are opened to coincide with the eyes in the wide- and thin-drilled ends of the bars, so that

the supporting-pin may pass through the entire series of ribs on the base, and through the entire series of bars between the ribs and outside of the base, with an improved effect in supporting as well as in being supported by the connections thus formed.

By this novel construction of the base of the post, and this novel combination of the posts and bars, instead of making the lower chord of series of two eye-bars, separated by the entire width of the base of the post, and supported only upon the outside of the post by the projecting extremities of the connecting-pin, and instead of subjecting the extreme ends of the connecting-pin to the entire strain of the chords and braces while the middle of the pin is subjected to the entire weight of the posts, the appellant's patent of 1862 permits the multiplication of the bars (by bringing them close together) without increasing the width of the post, and not only relieves the pin from the undue shearing strain at its ends, but braces it at short distances within the base itself against the weight of the post, and supports it further by the diagonal braces, distributing the strains along the entire length of the pin, and making a more secure and compact connection.

The chords, the ribs, and the diagonal rods thus disposed obviate all danger of bending the connecting-pins, which can only yield by being sheared off by the tensile strain on the chords and diagonals; and the chords thus well supported at short intervals will also support the floor-beams and track, without the employment of auxiliary beams for that purpose.

The further connections are such that the strains from the lateral tension rods are transmitted to the struts without straining the ribs of the bases of the posts.

The only thing adduced by the appellees as bearing upon the novelty of this construction and combination of the lower chords is a description of the Newark dyke bridge, which is essentially different from the construction and combination set forth in the patent of 1862, in the particulars above specified. Except that it has posts and eye-bars, or links, which the appellant's patent specifically disclaims, as above noted, the Newark dyke bridge has no resemblance to the thing patented.

It is, however, the appellees' presentment of the state of the art at the date of the patent, and serves only to illustrate the decided improvement in bridge construction effected by Mr. Linville's invention. The eye-bars are outside of the posts only, and the pins are unrelieved either at the ends or intermediately.

The substantial differences between such structures and the lower chords of appellant's patent of 1862 are stated by Mr. Linville in his deposition, as follows:

Reference is made to a printed work entitled "Papers and Practical Illustrations of Public Works," etc., published in England by John Weale, in 1856, and to Plate 10 of drawings of Newark dyke bridge of said work. The reference in this work I have carefully examined, and I think there is a substantial difference between the chords as employed in that bridge and as described and employed in our patent of 1862. In both the chords are made of thin wrought-iron eye-bars, placed on edge, and so resemble each other in configuration; but the respective combinations are not the same, inasmuch as the chords in the Newark dyke bridge are not applied between ribs on the bottom or base of the post, while in our patent they are so applied. These different applications and combinations produce very different results. In the combination as employed in the Newark dyke bridge, for example, the strains caused by the suspension diagonals and lower chords is exerted on the ends of the pins, while at the same time the posts bear on the centre of the pins, and so, under heavy weights, will bend or tend to bend the pins; while in our combination, the strains of the diagonals, lower chords and posts, by the intervention of the ribs, are distributed along the entire length of the pins, which are accordingly capable of resisting, without danger of breaking or bending, a much heavier strain.

Record, p. 58.

× *Q.* 98. What is the difference and purpose between wide and thin eye-bars set on edge, and used as tension-braces in bridges, and the same bars used in lower chords?

A. In one respect the functions performed are the same. In both cases they resist tensile strains. When used as chords, as claimed in our patent of 1862, the additional purpose is to

bring the bars as closely together as possible on the pin, and to be able to arrange them between the ribs of the post, and at either side of the suspension-braces in order to prevent the bending of the connecting-pin. The thinner the bars are made the shorter the pin becomes, and the narrower the base of the post, making the connection more secure, compact, and economical.

Record, p. 69.

So far as the record discloses, and so far as was contended by the defendants below, the only difference between the lower chords described in appellant's patent of 1862 and those furnished by defendants to Kellogg, Clark & Co., for the La Salle bridge, is that in the latter the eye-bars, while wide and thin and drilled at the ends, were round in section for so much of their length as extended between the wide- and thin-drilled eyes, instead of being wide and thin from end to end; and the proposition of the defendants below was, that as the patent only mentions wide- and thin-drilled eye-bars, the claim was not infringed by wide- and thin-drilled eye-bars that were round in section between the wide- and thin-drilled eyes or ends; the defendants insisting that the bars described in the patent *must* be wide and thin throughout their entire length, because an *essential* function of these bars is to support the roadway.

The entire substance of the testimony on this point is in Mr. Linville's deposition:

× *Q.* 92. What forms would come under the definition of wide and thin eye-bars?

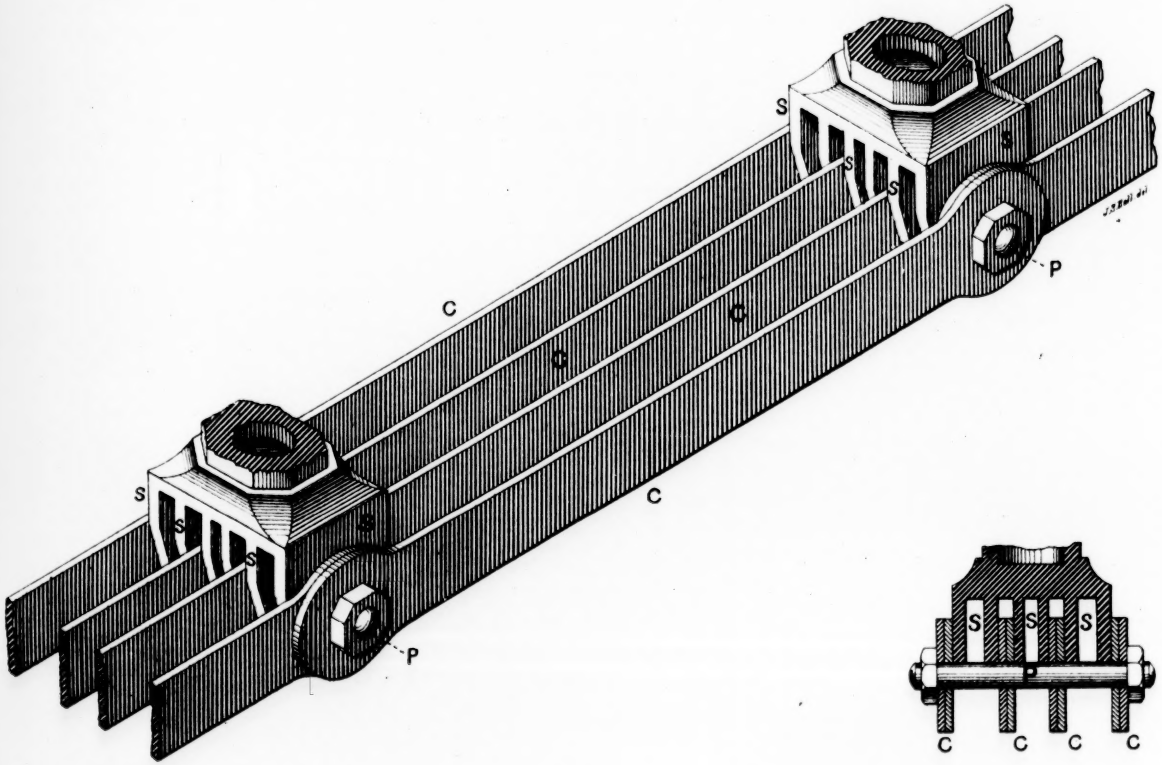
A. I suppose any bar which was wider in one direction than the other, and has a wide eye, would be called a wide and thin eye-bar.

× *Q.* 93. You have spoken of eye-bars used in the bridge built by Kellogg & Clark; were those eye-bars wide and thin and set on edge?

A. They had wide, thin eyes, and were intended to sit on edge.

× *Q.* 94. Was not the whole body of those eye-bars, except the eye, round?

A. It was.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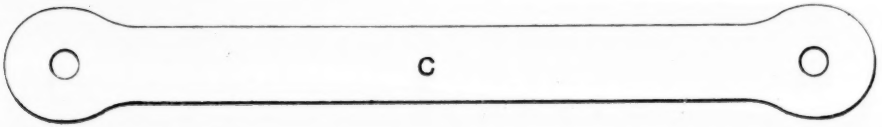
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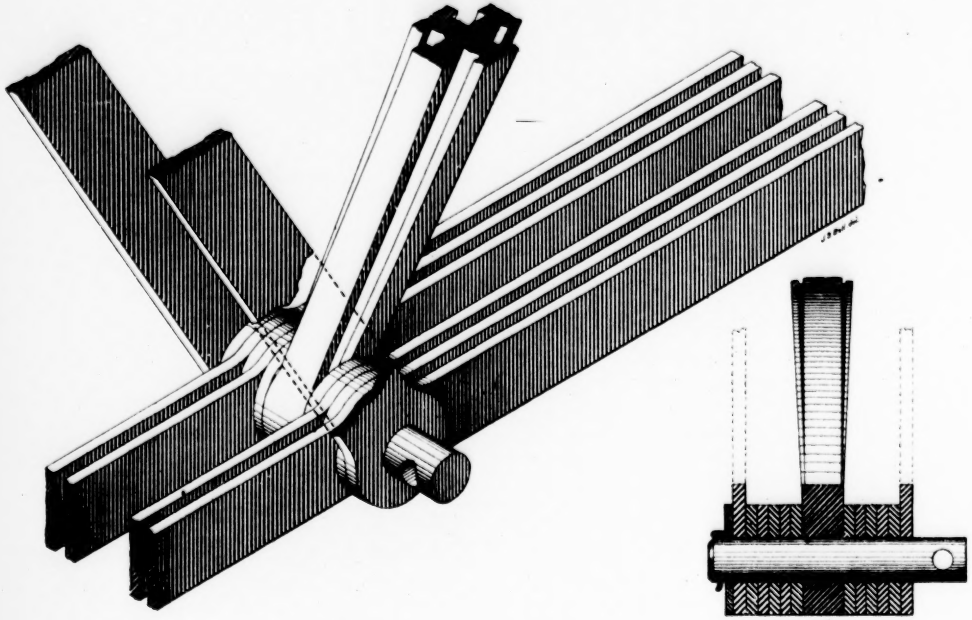


NEWARK DYKE BRIDGE.

D. J. PARTRIDGE PHOTO-LITH. 23 SEVENTH ST. PHILA.

× *Q.* 95. Do you call a round bar, with a flattened end enlarged for an eye, a wide and thin eye-bar?

A. I would call the eye wide and thin; before the eye was formed I would call the bar a round bar.

× *Q.* 96. After the eye is formed is such a bar properly described as a wide and thin eye-bar?

A. I think it would be if it had a wide eye in comparison with its thickness.

× *Q.* 97. Then I understand that the term "wide, thin eye-bars" includes any form of bar that has a wide, thin end to it, with a pin-hole through such flattened end?

A. I think that would be a correct description of a wide, thin eye-bar, notwithstanding the fact that in our patent of 1862 we describe bars made wide in the body, for the special purpose of bearing transverse strains. For the purpose of applying the same between the ribs on the bases of the post, a round or rectangular bar could be used with equal facility, provided the eye end was wide and thin.

Record, pp. 68, 69.

Mr. Linville is the President of the Keystone Bridge Company.

J. L. Piper. Record, p. 34, × *Q.'s* and *A.'s* 106, 107.

The sum of the evidence is, then, as to this point, that in 1868 the appellees made for Kellogg & Clark, for the La Salle Bridge, bases of posts, which bases had ribs projecting downwards for the insertion of the lower chords, the ends of the chords being intended to be inserted between these ribs and fastened, all substantially as described in the appellant's patent of 1862; and eye-bars which had wide- and thin-drilled ends or eyes, and these wide- and thin-drilled ends or eyes were to be set on edge between the ribs on the bases of the posts, and the bases and bars connected together, substantially as described in appellant's patent.

The only difference being that the body of the bars between the wide- and thin-drilled ends or eyes were round in section instead of being wide and thin.

Postponing, for the moment, the ultimate question in the case, it would seem that the issue under this point is reduced to the

simple inquiry whether, upon a fair construction of appellant's patent, the first claim is so restricted as to be infringed by the construction of the lower chords of truss bridges, of series of wide- and thin-drilled eye-bars applied on edge between ribs on the bottoms of the posts, and connected by pins, supported substantially as described, but only when the wide- and thin-drilled eye-bars are wide and thin from end to end.

Such an application of the rules of construction would be unusually severe, and the spirit in which courts administer the patent laws would only be constrained to such stringency by very positive expressions in the specification. It is submitted that this specification does not warrant such restriction.

The improvement is not confined to the eye-bars; on the contrary, it disclaims the eye-bars or links separately.

It is an improvement in iron truss bridges.

This improvement consists in a novel construction of the lower chords of such bridges, and a novel mode of applying the same in combination with the posts and other parts of the truss.

This improved construction and application comprises a combination of the following elements:

1st. Wide- and thin-drilled eye-bars applied on edge.

2d. Bases of posts provided with ribs, between which the eyes of the bars are fitted, as they are also fitted outside of the bases.

3d. Pins connecting the posts and the eye-bars, and supported in the bases and the eye-bars in a novel and peculiar manner.

By this disposition and combination of parts, the strains of the diagonals, lower chords, and posts, by the intervention of the ribs, are distributed along the entire length of the pins, which are, accordingly, capable of resisting, without danger of breaking or bending, a much heavier strain than under the prior construction, in which the strains were exerted on the ends of the pins, while at the same time the posts bore upon the centre of the pins, and so, under heavy weights, tended to bend the pins. It also enabled this increased resistance to be secured without making the posts wider and heavier than before.

As to the eye-bars, the specification says, referring to the drawings:

The bottom chords are each composed of a series of wide, thin eye-bars of wrought-iron placed on edge, and *fitted* outside of the bars and between the ribs.

The bars C are extended in width at their ends and drilled to receive connecting-pins.

So the patent only demands that the bars C, C, have wide, thin-drilled eyes or ends which shall fit on edge between the ribs on the posts and receive the pins by which the posts and bars are connected.

It is true, the specification further says that the eye-bars are placed on edge to enable them to give vertical support to the roadway, and, after describing the assemblage of parts constituting the chords, it also says, "and the chords being thus well "supported at short intervals support the floor-beams and track "*without* the employment of auxiliary beams for this purpose;" but this is not an essential *requirement* of the construction specified in the first claim, and the Court will scarcely hold that there could be no infringement of that claim unless the floor-beams and track were laid directly upon the eye-bars, or that the claim could be evaded by making the lower chords just as described in the patent and *superadding* auxiliary beams for supporting the roadway, or not using the eye-bars to support the roadway alone.

Even in that view no reason is suggested why eye-bars of round section between the posts would not support the floor-beams and track or the roadway as well as the flat-edged bars. The round bar would perhaps be the stronger if anything. In both cases the same result is attained: the wide- and thin-drilled eyes of the round bars are the same as the wide- and thin-drilled eyes of the flat bars; and so in both cases the wide- and thin-drilled ends of the bars are fitted between the ribs on the bases of the posts; the base is narrower and the pin shorter than in the old construction; the pin is supported in both cases in the same way and at the same points, and the connection of the parts is in both cases alike more secure, compact, and economical. With the same number of ribs in the base there would be the same number of eye-bars in the chord, whether those bars were flat or round between the wide- and thin-drilled eyes or

ends. If round bars were used there might be less space longitudinally between the bars from one post to the other than if the bars were flat throughout their entire length, but there would be no difference in the spaces transversely between the bars in the same post. A coarser or a finer *grating between the posts* would be the only difference.

It is therefore respectfully submitted that the form of the chord-bars between the wide- and thin-drilled eyes or ends is not of the essence of the first claim of the patent of 1862; in any event, not so indispensable that this claim could not be infringed by the construction of the lower chords and mode of applying the same in combination with the posts and outer parts of the truss, substantially as described in that patent and specified in the first claim thereof, with so slight a variation as that of making the eye-bars with wide- and thin-drilled ends, but with narrower or thicker or round or square intermediate section, even if such variation of the intermediate section amounted to a patentable *improvement* of this feature or ingredient of the construction or combination claimed: that it is not *essential* that the roadway or the floor-beams and track should be supported upon the eye-bars without the employment of auxiliary beams for that purpose; but that the first claim of the patent of 1862, instead of being only for wide- and thin-drilled eye-bars which are wide and thin from end to end, is for a combination, one element of which comprises substantially such bars having wide- and thin-drilled ends or eyes adapted to and applied in the construction of lower chords of truss bridges, the other elements of the combination being correspondingly adapted and applied to the eye-bars, all substantially as described in the specification.

Winans *v.* Denmead, 15 How., 342–344.

And it is respectfully submitted that the Court below erred in its construction of this claim and in dismissing the bill thereupon.

II.

THE THIRD CLAIM OF THE PATENT OF 1865.

This patent states that the invention consists of certain improvements in the construction of the wrought-iron truss

bridge for which the patent of 1862 was obtained. "In the "truss bridge shown in the accompanying drawings the general "arrangement of parts is similar to that shown in our previous "patent, just referred to,—the improvements forming the sub-"ject-matter of this invention relating to the following par-"ticulars:"

* * * * * * * * * *

3. The use of bottom chords of thin wrought-iron plates, *the eye of which, at each end, instead of being cut out of a rolled plate and drilled or forged into shape, is upset under strong compression, so as to give, at the eye of the bar, a degree of strength equal or superior to that of the bar at any point between the eyes.*

* * * * * * * * * *

The lower chords D consist of wide, thin-rolled iron bars with enlarged ends, which are made by upsetting the rolled bars by compressing them into the desired shape in moulds into which the heated iron is forced under immense pressure, thereby increasing the density, toughness, and strength of the enlarged ends, and permitting the holes or eyes for connecting-pins N to be cut out without rendering the transverse section at the eye less than that of other parts of the bar or diminishing the transverse or longitudinal strength of the chord-bar.

We do not claim the upsetting of iron *bars* in the manner described, nor any peculiar mode of performing *the operation*, but merely the use of chord-bars for bridges, *the eyes of which is formed so as to give additional strength to the bar where much needed.*

* * * * * * * * * *

Having thus described our improvements in wrought-iron truss bridges, which are applicable also to truss-frames for other purposes, what we claim as our invention and desire to secure by letters patent is,—

* * * * * * * * * *

3d. The use for the lower chords of truss-frames, of wide and thin-rolled bars with enlarged ends, formed by upsetting the iron, when heated, by compression in moulds of the required shape, for the purpose of increasing the density, toughness, and strength *of the eye of the rod, and enlarging the eye*

without diminishing its transverse section, substantially as hereinbefore described.

In their answer the defendants below made this averment respecting the subject-matter of this claim:

"And these defendants, as to so much of the bill as prays "relief in respect of an alleged violation of the patent set up "by the complainants for the use of bottom chords of thin "wrought-iron plates, the eye of which, at each end, instead of "being cut out of a rolled plate and drilled or forged into "shape, is upset under strong compression, say that by the "letters patent set up by the complainants bearing date the "31st of October, 1865, the complainants' assignors claimed "and obtained no more than the grant of the right to use "bottom chords made of wrought-iron, compressed or moulded "into the forms in which they are used as chords. They do "not, in said patent, claim the exclusive right to the use of "bottom chords for bridges, nor the use of bottom chords "when made in any particular form nor of any particular sub-"stance or material, nor to the mode of making or forming the "material which is to be used as a bottom chord, but only to "the exclusive right to use as bottom chords particular forms "of iron, formed or made in a particular manner,—that is, "when not formed by the common method of hammering and "welding, but formed by compression."

Record, pp. 7, 8.

* * * * * * * * * *

"*And these defendants aver that the said claim and grant were* "*of matters in all particulars designed and invented by these* "*defendants; that the design was conceived by these defendants,* "*and communicated to the assignors of the complainants, with* "*information that letters patent were intended to be applied for* "*more than two years before the assignors of the complainants* "*obtained their said patent; that one of the objects for which the* "*invented article was intended to be used was and is precisely that* "*use claimed by complainants' assignors in their said patent as* "*theirs exclusively; that this intended use of the thing to be made* "*under the projected invention of the defendants was also then* "*communicated by defendants to complainants' assignors;* that

"complainants' assignors' method was perfected and the iron "plates made; and these were ordered by the complainants' "assignors, or one of them, at the instance of defendant, S. J. "Reeves, in 1863; and they were made by defendants, and "sold and delivered to complainants' assignors, or one of them, "to be used as bottom chords in the manner described in the "assignors of the complainants' letters patent, as early as April, "1864, and were so used by them, as these defendants believe, "long before they applied for and obtained the said letters "patent under which they claim their title; and that the letters "patent set up by the complainants in this particular is a fraud-"ulent attempt to secure to themselves the exclusive right to "one of the uses *of the manufactured article* made by these "defendants under their patent; *which use was, by the complain-"ants' assignors, known to be one use, to or for which the articles "patented and made by defendants was intended and was appli-"cable, and which intention was communicated to the complain-"ants' assignors by the defendants.*"

Record, p. 9.

The defendants below did not insist upon or support by any proof this claim to the prior invention of these chord-bars, while in contravention of their answer the complainants established the facts which appear in the following extracts from the testimony:

JACOB SZINK being duly cautioned and solemnly sworn, deposeth and saith:

Q. 1. State your age, your place of residence, and your occupation.

A. I am forty-four years old; place of residence, Altoona, Blair County, Pennsylvania; by occupation, blacksmith; foreman of blacksmith-shop No. 1 of Pennsylvania Railroad Company.

Q. 2. How long have you resided at Altoona?

A. I went there in 1852.

Q. 3. Have you ever made eye-bars, such as are used as lower chords of railway bridges?

A. Yes, sir.

Q. 4. How were they first made by you, and when?

A. They were made out of flat bars, by turning over and welding down to form the eye; they were also made by jumping pieces on the side; also, in a die; also, in a machine; first made in 1861, in the machine.

Q. 5. Please describe the machine, and state under whose directions it was made, or by what name the process was known.

A. The first machine we made was a die, bound together by two clamps, in which we laid the bar, heated, and drew it up at the end by a follower-plate, to fill up the recess in the casting of the die, which formed the eye of the bar; after that we made a machine larger, on the same principle as the former casting. This machine was made as directed by Mr. Piper, with the addition of the box and strap-hinges, which made it more convenient to work. It was also drove up by a follower, in the first place with sledges; then there was a screw applied; next was a knuckle-joint applied, to work more effectual and give more power; the screw and the sledges were not quick enough. Both these machines were made under direction of Mr. Piper. The process was known as an upsetting-machine, to form eyes for bridges. On the first machine, Mr. Piper was experimenting; on the small one he found it was a success, and he made a large one. The first one was made in December, 1861, and between that and July, 1862, he had the other made.

(Counsel for the Keystone Bridge Company produces and introduces a model, marked Keystone Exhibit E.)

Q. 6. Please look at Exhibit E, and state what the same represents.

A. This model represents John L. Piper's upsetting-machine; the die just as Piper's,—the machine I have been speaking about; that is this die, just exactly; the follower also. The only difference I see is, the strap-hinges clamp the box together. We had strap-hinges on the large machine. The balance of this machine is just like the other; I can see no other difference.

Q. 7. Did you see the machines which you say were con-

structed under Mr. Piper's directions, in 1861 and 1862, in operation; and if so, how did they work?

A. I saw them in operation; they worked as I stated before; we made eye-bars in them; the eye-bars were so good that the superintendent of the Pennsylvania Railroad, Mr. Lewis, was satisfied with them; that they were better than the ones that were welded.

Q. 8. State where the machines referred to by you now are, if you know.

A. It was taken out of my shop and placed in the bridge-shop, where they could attach power to it; it remains there now. I suppose about a year ago that I saw it there.

Q. 9. Has the machine, which you say was constructed in 1862, been in use up to the time when you last saw it,—say about a year ago?

A. It was in use on the Steubenville bridge, making iron; I mean upsetting iron for that bridge. This was in 1864, I guess; at the time that I came out of the army; they were then working at it, and working the machine for iron on that bridge.

Cross-examination.

× *Q.* 10. How many machines have there been constructed for making links, by the upsetting process, for the Pennsylvania Railroad Company, of this character?

A. I do not know of any made for the Railroad Company.

× *Q.* 11. How many have there been constructed or used in their shops for anybody?

A. This one. The first one I don't count, as it was only a die, to try the experiment to see if it could be done; that is the way I understood when I done it.

× *Q.* 16. When did you go into the army?

A. In 1861, April, at first, and was discharged in July or August, 1861; again about July 12, 1862, and was in then until May, 1863, or thereabouts.

× *Q.* 17. When you returned to the shops of the company, in May, 1863, did you find or know of this link-making machine being in use in those shops?

A. Yes, sir; I did.

× *Q.* 18. Were links then being made on that machine as an ordinary matter of business?

A. No, sir; they were making bridge-rods or bars, and not links.

× *Q.* 19. Do you mean making them on that machine?

A. Yes, sir.

× *Q.* 20. Were those rods that were then being made on that machine flat or round?

A. They were square and round,—called square.

× *Q.* 21. Were any of them flat and resembling the bar, as exhibited in model E?

A. No, sir.

× *Q.* 22. Do you call those round and square rods, which you have described as being then made on that machine, eye-bars?

A. Well, some were bars and some rods; I think there were eyes on one end of them.

× *Q.* 23. Were the ends of those rods or bars, which you saw being made, flattened out at the ends in which the eyes were?

A. They were welded round and flattened a little.

× *Q.* 24. How was this welding done?

A. In the fire, on the anvil.

× *Q.* 25. What part of that process, then, to which those rods and bars were subjected, was performed in the machine to which you have referred?

A. The one end that had the screw on. This die was taken out, and a die to form the end on which the screw was to be was substituted. This was after my return from the army, in May, 1863.

× *Q.* 26. How long after this time did you first see used, in that machine, dies for moulding flat eye-bars, similar to that shown in this Exhibit E?

A. I don't know that I ever *seen* them making eye-bars, except when we first experimented.

× *Q.* 27. When you first experimented on making flattened eye-bars, how many flattened eye-bars were made for use?

A. I don't know that they were used.

× *Q.* 28. Did you ever see a machine in the shops, with dies for making the flattened eye-bar, such as is shown by Exhibit E?

A. Yes, sir; I have seen Mr. Piper's there.

× *Q.* 29. At the time you saw it, were the dies in it for making the flattened eye-bar?

A. When I was experimenting, the dies were in it then.

× *Q.* 30. After you had done experimenting, and the machine was removed to the shop where the power was applied, did you ever see any eye-bars that were made in that machine?

A. When the machine was moved I was in the army.

× *Q.* 31. Did you ever see any flat eye-bars that were made in that machine of Mr. Piper, except when experimenting?

A. No, sir.

× *Q.* 32. Did you ever, except when experimenting, see that machine with the dies in it making flat eye-bars?

A. Not after it left my shop.

× *Q.* 33. If I understand you right, nothing was done in your shop, except experimenting, in the way of making flat bars?

A. That is all.

× *Q.* 34. (The eye-bar in Exhibit E being shown to witness.) Was this eye-bar, in the form in which it now appears, made upon a machine such as you have described?

A. I do not know anything about that eye-bar in Exhibit E. The eye-bars which were made were something like that, as near as could be made.

× *Q.* 35. Did you ever see an eye-bar made upon the machine you have described, with a uniform thickness, without the eye swelling thicker than the bar, in the process of upsetting?

A. You can't get any thicker than the mould will allow.

Re-examined.

Q. 45. I understand that when the machine was used in your shop, the pressure was applied by hand-power; am I correct?

A. Yes, sir.

Q. 46. How many flat eye-bars were upset in the machine in that manner, and what was the quality of them?

A. I can't state how many; there were several upset; of course, we didn't want to waste labor, as it was hard labor. I don't suppose we made more than a half-dozen, if that. We just made enough that it would work, and could be done if sufficient power was attached to it; the quality was good; far superior to the ones made by hand; just the same as that pattern; just as perfect.

Record, pp. 21, 25.

ROBERT NEBINGER testifies that he made the machine for Mr. Piper between January 15th and the last day of February, 1862.

Exhibit E represents that machine, except that the machine had wrought-iron bands around the outside of the mould to strengthen it.

Record, pp. 25, 26.

JOHN L. PIPER, a witness on part of the complainants, Keystone Bridge Company, being produced, and duly cautioned and sworn, deposeth and saith:

Q. 1. State your age, your place of residence, and your occupation.

A. My age is forty-eight years; residence at Pittsburg, Pennsylvania; my occupation is that of bridge-building.

Q. 2. Are you the same John L. Piper named in the Letters Patent Nos. 34,183 and 50,723, which are sued on in this suit?

A. Yes, sir.

Q. 3. How long have you been engaged in the occupation of bridge-building?

A. I think I commenced business in the summer of 1845; have been engaged in that business from that time to this, excepting between March, 1851, until August, 1856.

Record, p. 26.

Q. 26. What function is performed by the lower chords or eye-bars of iron bridges?

A. The bottom chords of the bridge are subject to a tensile

strain equal to the weight of the structure and the passing load; that I would understand to be the office of the bottom chord.

Q. 27. Upon what part of the chord is the strain greatest?

A. The centre of the span.

Q. 28. Will you please state how the lower chords, as employed in the construction of the Schuylkill bridge, were made?

A. They are made—each truss has four strands of lower chord or eye-bars, varying in thickness and width according to the position they occupy in the truss; the ends where the connecting-pin passes through are widened out sufficiently to leave a section at the centre of the pin-hole equal to the section of the bar between the enlarged ends.

Q. 29. Will you please state how such enlarged ends were made?

A. They were made with a forge-hammer.

Q. 30. Will you please look at the model, Exhibit E, and state what the same represents?

A. A machine that I got made in the spring or during the winter of 1862, for the purpose of making eye-bars for bridges, with some few exceptions that are not like the original; these fastenings are not like the original; they were heavy bars of wrought-iron that went around the box, with joints on the back side, and in front they pass by each other, with a suitable opening for the purpose of driving a key to hold it together.

Q. 31. Where was said machine made, and who did the work upon it?

A. It was made in the Pennsylvania Railroad Company's shop, at Altoona; Mr. Boyden made the patterns, and Mr. Maxwell had the castings made; Mr. Szink made the wrought-iron work, and Mr. Nebinger made the frame and put the machine together.

Q. 32. Give the dimensions of the machine, and state where it now is.

A. I could not give the exact dimensions. My recollection is, that the box-part, where the end is formed, is about twenty inches wide; I think, thirty inches or three feet long, and about

eight inches in depth. The machine at present is in the Altoona shops, or was, a month since, with the exception of the large box, where the dies are held.

Q. 33. What use, if any, was made of this machine by yourself, after its construction?

A. After it was constructed, we took it into the blacksmith-shop and used it for upsetting flat bars into the shape we were using for lower chords of bridges.

Q. 34. When was this?

A. In the spring of 1862.

Q. 35. How did it answer the purpose for which it was designed?

A. As first constructed, with the screw, the screw was found to be too slow for to work successfully; otherwise the machine worked well.

Q. 36. What means, if any, were employed for applying the power, other than the screw?

A. Afterwards we took out the screw, and instead of it used what is usually called a toggle-joint, moved by an eccentric, and driven by steam-power, with a wedge to be applied between the end of the toggle-joint and the end of the follower or movable part of the die, for the purpose of getting sufficient motion in the movable part of the die to upset any required length.

October 26th, 1869.

Present: Mr. Collier, for plaintiffs; Mr. McMurtrie, for defendants.

Examination of JOHN L. PIPER resumed.

Q. 37. Have you seen in use machines for upsetting chords for bridges similar to the one constructed at Altoona; if so, where?

A. I have seen such at Pittsburg. We have one at the Keystone Bridge Works.

Q. 38. How does it answer?

A. Answers satisfactory.

Q. 39. State whether or not, prior to 1864, you had a conversation with George H. Sellers relative to the making of chords for bridges by the upsetting process; if so, state when said conversation was had, and what was said.

A. I had such conversation with Mr. Sellers at Phœnixville, in the fore part of February, 1863; it may be the 9th; I think it was; I may be mistaken. Piper & Shiffler were then in company as partners, and we had taken a contract to build a bridge across Mayland Creek, West Philadelphia, in which we had agreed to use eye-bars for lower chords. I had understood that the Phœnix Iron Company had contracted with the Pennsylvania Railroad Company to make the eye-bars for the channel span of the Steubenville bridge, and I went to Phœnixville to see if we could contract with them to make them for Mayland's. In conversation with Mr. Sellers, at that time, I described to him the manner in which we had made eye-bars at Altoona. I told him how we had undertaken to make them by turning over the ends of the bars and welding the two thicknesses together, for the purpose of getting a head sufficiently broad to admit of boring out the hole for the pin, without reducing the section at centre of pin to a less size than the section of the bar between the heads; also, by welding pieces on the side of the bar to form the heads; which modes did not prove satisfactory. I then told him that I got a set of dies made for the purpose of seeing whether we could not make these bars by upsetting. I told him that we tried these dies by driving the follower in with sledges; and after making some in this way, and submitting them to the engineers and superintendent of the road, they were so well satisfied with them they directed me to go on and get up a machine for the purpose of doing it by power. I told him that I had then got up a machine with a screw as the power, similar to Exhibit E, and that we had made some eye-bars with the machine that were perfectly satisfactory, but that we had discovered, in making them, that our power was not sufficient, in the way we have it arranged, for to make them economically, and I advised him to be careful, in getting up his machine, to have this power ample.

Record, pp. 29, 31.

Cross-examined.

× *Q.* 155. When were eye-bars first made without welding by the process of upsetting?

A. To the best of my knowledge, in 1861.

× *Q.* 156. Where were those made?

A. At Altoona.

× *Q.* 157. Where were the eye-bars so made used?

A. They were not used at all for bridge purposes.

× *Q.* 158. What was their size?

A. My impression is they were about three inches wide by five-eighths of an inch, or three-quarters, thick. They were, I think, one-half the size of the links we had been using in bridges.

× *Q.* 159. Were these made on Mr. Linville's machine?

A. At first they were made simply with dies or forms clamped together, the movable part of the die being driven in with sledges; we afterwards made a machine, which Exhibit E represents, in which we made more of them.

× *Q.* 160. Were any of the eye-bars made on that machine ever used in practice; and if so, when, for the first time?

A. I do not know whether there was any made of it; there was not for the first year, at which time I left the service of the Pennsylvania Railroad Company.

× *Q.* 161. What is the largest size bar that you ever knew formed into an eye-bar on that machine?

A. The bar of the size I have mentioned.

× *Q.* 162. Where is the box in which those bars were formed now?

A. I do not know.

× *Q.* 163. How many heatings did it require to form that eye-bar?

A. Sometimes we could upset them by heating twice; at others three or four times, in consequence of the power we used being slow.

× *Q.* 164. Was anything done to the eye-bars, in the way of finishing, after they left the machine in which they were upset; if so, what?

A. There was. The machine did not hold the die so perfectly rigid but that the bars would increase their thickness. After being taken out of the dies they were reduced to the required

thickness by being hammered, and afterwards trimmed off to the required shape.

× *Q.* 165. Look at the eye-bar in Exhibit E, and say whether that has been finished in the way you have mentioned since the upsetting process.

A. I think it has, from the appearance of it.

× *Q.* 166. Where were the eye-bars made that were used as links on the Steubenville bridge?

A. They were upset at the Phœnix Iron Works.

× *Q.* 167. Do you know why that company was employed to make those bars, and why they were not made on Linville's machine?

A. Mr. Linville or the Pennsylvania Railroad Company had no machine of sufficient capacity to manufacture links of the size required for the Steubenville bridge, and I was informed that Mr. Reeves agreed to get up one of sufficient capacity providing the Pennsylvania Railroad Company would give him the order for the links.

× *Q.* 170. Mr. Linville claims, in his patent of 1862, first, the construction of the lower chords, etc. What proportions between the width and thickness of the bar must exist to bring a bar within the definition of a wide and thin bar, or is there any definite proportion necessary to warrant the application of those terms to a bar?

A. I would understand it to mean that the bars were of such shapes as come within the manufacturers' terms called *flat bars*.

× *Q.* 171. Would a bar nine inches wide and one inch thick come within the description of a wide and thin bar?

A. Any bar that was wider than it was thick would come within the description.

× *Q.* 172. (Mr. Linville's patent of 1862 and Linville & Piper's of 1865 being shown to witness.) Please state what is the difference between the claims in these patents so far as respects eye-bars other than this: in the earlier patent the use of eye-bars formed with wide and thin bars is claimed without regard to the mode in which they are made; in the latter the same use of these bars is claimed when made by the upsetting process.

(Objected to as calling for testimony as to that which is matter of law to the Court.)

A. My understanding of the patent of 1862 was that the claim covered the use of eye-bars for lower chords of bridges, without regard to how they were manufactured, for the reasons therein stated. The patent of 1865 was intended to cover the manufacture and use of eye-bars made by being upset in dies of the required shape.

× *Q.* 173. Will you point out, in the patent of 1865, where there is any allusion to the mode in which eye-bars can be made by the upsetting process?

A. I find it here. The lower chords, D, consist of wide, thin-rolled iron bars, with enlarged ends, etc., as set forth on page 7 of printed copy.

× *Q.* 181. What is meant by the phrase "process of up-"setting"?

A. What I would understand would be to increase the area of the iron by decreasing its length,—this being done either by pressure or hammering.

Record, pp. 41–43.

ENOCH LEWIS, a witness produced on part of complainants, being first duly cautioned and affirmed, deposeth and saith:

Q. 1. Where do you reside, and what is your occupation, and what was your occupation during the years 1860–1–2?

A. Philadelphia; purchasing agent of the Pennsylvania Railroad. From April 1st, 1860, until December 31st, 1865, I was the general superintendent of the Pennsylvania Railroad.

Q. 2. Are you acquainted with the construction of iron bridges and of the several parts composing such structures; and if so, what has been the sources of your information?

A. Iron bridges of several kinds were built during my term of office by the Pennsylvania Railroad Company, at its shops in Altoona, directly under my observation.

Q. 15. Did you have knowledge, at the time of its construction (about the commencement of the year 1862), of an upsetting-machine said to have been made under the directions of

Jacob H. Linville and John L. Piper, at Altoona, and which Exhibit E, now before you, purports to represent?

A. I did have knowledge of such a machine.

Q. 16. Did you see it in operation; if so, when, and how did it operate?

A. I saw it in operation about the time named, and it appeared to accomplish its work well.

Q. 17. What kind of work did you see performed by it, or in it?

A. The upsetting of the ends of rods or links for lower chords of iron bridges.

Q. 18. At whose expense was the machine made, whom did it belong to when made, and under whose authority was it made?

A. I think it was made at the expense of the Pennsylvania Railroad Company—belonged to it, and was made by my direction.

Record, pp. 47, 48.

JACOB H. LINVILLE, a witness for the complainants, being duly sworn, deposeth and saith:

Q. 1. Where do you reside, and what is your occupation?

A. I reside in Philadelphia; my occupation that of a civil engineer, and am specially engaged in the construction of iron bridges.

Q. 2. Where did you reside, and how were you employed, from 1860 to 1864, inclusive?

A. I resided at Altoona, and was the resident engineer of the middle division of the Pennsylvania Railroad, and afterwards engineer for buildings and bridges for the Pennsylvania Railroad and its dependencies.

Q. 3. How long have you been specially employed in designing and constructing iron bridges?

A. Since 1857.

Record, p. 51.

Q. 21. Calling your attention to the lower chords, as claimed in the first claim of your patent of 1862, and the third claim of your patent of 1865, and to the references as contained in the answer of the Phœnix Iron Company and others to the use,

prior to said patents, of lower chords of alleged similar character, will you point out wherein such references are like or unlike the chords as described and claimed in your patents, respectively?

A. * * * * * * * * * *

In our patent of 1865 we claim "the use for the lower chords "of truss-frames of wide- or thin-rolled bars with enlarged ends, "formed by upsetting the iron when heated, by compression into "moulds of the required shape, for the purpose of increasing "the density, toughness," etc. So far as the claim of this patent is concerned, I cannot see that the reference of the defendants has any application whatever, since there is no suggestion whatever in the work of "Weale" descriptive of the lower chords of Newark dyke bridge, that they were made by the upsetting process or by any other mode than the ordinary mode in use at that time, which consisted in enlarging the ends by the well-known process of forging. In the other reference of the defendants, the links described therein were enlarged at the ends by the patent of Messrs. Howard & Ravenhill, by passing them sideways through the rolls, which is wholly different from the method by which the chords as described in our patent of 1865 are made, and which therein is called the upsetting process.

Q. 22. What do you know relative to the use by the defendants of lower chords for iron bridges? State, if you know, the combination in which the same are employed, and the process by which made, and wherein, in such particulars, the same resemble or differ from the lower chords, combined and made as described in your patents of 1862 and 1865, respectively.

A. I saw the bases of the posts as constructed by the Phœnix Iron Company, and intended for the La Salle bridge in Illinois. These bases had ribs projecting downwards for the insertion of the lower chords, the ends of the chords being intended to be inserted between the same and fastened all the same substantially as described in our patent of January, 1862. I saw at the same time the eye-bars which were intended for insertion between these ribs, and the same had enlarged ends which had been formed by upsetting the iron, when heated, by compression

into moulds corresponding in shape to the ends of the chords, for the purpose of increasing their densities, substantially as described in our patent of 1865. I think it was about two years ago that I saw these chords.

Q. 23. How do you know that the Phœnix Iron Company made these bases and chords, and how do you know that the chords were made by the upsetting process?

A. The bridge was being built to my knowledge by Charles Kellogg, of the firm of Kellogg & Clark, bridge-builders; and I have knowledge from Mr. Reeves' conversations and admissions in my office that the iron-work of them was made by the Phœnix Iron Company. I think, also, that some of the pieces that I saw had the mark of the Phœnix Iron Company on them. The opinion expressed as to the manner in which the lower chords were made—that is, by upsetting—was derived from the inspection of the ends, and from my knowledge of the appearance and the marks of the mould on chords so made.

Q. 24. Have you read, and do you understand, the description of the process of upsetting chords as practised by defendants, as testified to by Samuel J. Reeves (answer to *Question* 36 of his testimony)? (Rec., p. 82); and, if so, state wherein, if at all, such process differs from that described in your patent of 1866.

A. I have read the testimony of Mr. Reeves referred to, and think there is no substantial difference between the defendants' process therein described and as described in our patent of 1865. In our patent we describe the enlarging or upsetting the ends of the chords by compressing them into the desired shape in moulds, into which the heated iron is forced under immense pressure. According to the testimony of Mr. Reeves, the process of the defendants contemplates the heating of the end to be upset or enlarged, and placing this end in a die or mould which is larger than the desired thickness of the chord; pressure is then applied to the chord until its end is made to fill the die or mould; it is then removed, reheated, and placed in another mould or die, which is of the width required for the end when finished; pressure is then applied to this die, and by means of this pressure the heated end is spread or enlarged so as to fill the die or mould. The object sought to be obtained

in both is the enlargement of the end so as to permit the holes or eyes for the pins to be made without reducing the transverse sections of the ends of the chord to a less area than that of the body of the chord, and of so accomplishing this by means of pressure as to increase the density and toughness of the metal. Mr. Reeves has not described the means of applying the pressure in the machine used by them, nor the manner by which the box of the machine holding the dies is bound together; but while in such respects there may be a difference between the methods of applying the pressure as practised by them from the mode as practised by us, yet in both cases the chords are formed under pressure, and so the chords and the method of upsetting them are, in my opinion, substantially the same.

Q. 25. Look at the machine, Exhibit E (testimony of Jacob Szink), and state what it represents, and when and by whom it was invented.

A. That machine is the model of a machine invented by J. L. Piper and myself, as constructed at Altoona, under our direction, early in 1862, for the purpose of performing the process of upsetting. The original machine was constructed at the expense of the Pennsylvania Railroad Company, and was and is their property.

Q. 26. Describe the operation of the machine represented by Exhibit E.

A. This consists of a mould or die having a lid which is hinged so as to be capable of being lifted, permitting the insertion of the heated chord, and its removal when upset or enlarged. The machine also embraces a "follower," to the end of which pressure is applied so as to cause the heated chord to spread or fill the mould or die,—the lid of the mould being keyed down during the application of the pressure.

Q. 28. Calling your attention to the correspondence between yourself and Samuel J. Reeves as set forth in the answer of the defendants (pages 14, 15, printed copy), will you state whether the same are correct copies of the originals, and also the circumstances attending the writing thereof?

A. The said copies are correct. At this time, January, 1863, the Pennsylvania Railroad Company was engaged in the con-

struction, under my supervision, of the Steubenville bridge, for which larger chords were required than had been employed in any bridge previously constructed under my charge. It was necessary for the Pennsylvania Railroad Company to have the chords made at some manufactory having the required facilities, and I invited proposals therefor from several firms, and among others from the Phœnix Iron Company, through Mr. Reeves, as shown by copy of my letter as found on page 12 of defendants' printed answer. My letter inviting proposals specified "hammered" chords, because the chords were required soon; and I did not know or suppose that there was any upsetting-machine in existence other than the one built by J. L. Piper and myself for the Pennsylvania Railroad Company, already referred to; and the die or mould of that machine was not large enough to contain the chords for that bridge, even if we had the power to work it, which we had not. After the receipt by me of the Reeves letter of January 19th, 1863, I went to Philadelphia, and there had an interview in the Phœnix Iron Company's office with George H. Sellers, then superintendent of the Phœnix Iron Company, in which I explained to him fully the mode of upsetting as invented by myself and Piper in the previous year, and explained the difficulty which we had encountered as to the power. Mr. Sellers told me that they would provide at their establishment the requisite power by means of a large hydrostatic press, and I then became satisfied that they would succeed in making or upsetting the chords, and gave the order as contained in my letter of January 28th, 1863. In employing the language contained in that letter,—"being satisfied," etc., "according to your process,"—I intended nothing more than to express my belief that, with their appliances for getting the requisite power, they would succeed.

Record, pp. 57, 60.

Defendants' Answer, Record, p. 14.

Cross-examined.

× *Q.* 99. Point out in your patent of 1865 any words which describe the mode of making these wide, thin eye-bars by the upsetting process.

A. On page 4, printed copy, commencing—"3d. The use of

"bottom chords," to the words "between the eyes;" also, on page 7, commencing at second paragraph from bottom of page 7, at the words "the lower chords D," to the words "chord-"bar;" also, the last paragraph of page 7, from the words "but "merely the use of chord-bars for bridges, the eyes of which are "thus formed," etc.; also the third claim of said patent.

× *Q.* 100. Then I understand that you do not claim a patent for the machine or process by which this upsetting is performed, but the use of the eye-bars when so made for forming lower chords of truss-frames?

A. I do not understand the patent as covering the machine. I understand it as covering a new article of manufacture,—that is, lower chords made by being upset in moulds under immense pressure, thereby increasing the toughness, density, and strength, etc.,—and securing the exclusive right to use the same.

× *Q.* 101. This process is performed by machinery of a peculiar kind, is it not?

A. The moulds in which the chords are formed, and the follower through which the pressure is applied to the end of the chord, is peculiar to all the machines that I have knowledge of. These are essential portions of the machine; the method of confining the mould, and of producing the requisite power to compress the heated iron, varies in all the machines that have been constructed since the invention of our Altoona machine, and may be varied at the will of the manufacturer.

× *Q.* 102. Is there anything in your patent which will enable a mechanic to form or make the eye-bars as described by you?

A. I believe there is, in the references already given. We describe these bars as made by "upsetting the bars by com-"pressing into moulds into which heated iron is forced under "immense pressure." This indicates the shape of the bar,—the moulding of it,—the means by which the moulding was produced, and indicates, in my opinion, the essential portions of the machine, and the process of moulding bars under pressure.

× *Q.* 103. Were these machines, moulds, etc., by which this work is done, well known to the trade at the date of your patent?

A. Our machines were in use at the date of our patent also Mr. Reeves'.

× *Q.* 104. Do you know of any others?

A. Kloman's machine at the Union Mills.

× *Q.* 105. When was this built and put in operation?

A. I think early in 1864.

× *Q.* 106. Who invented that?

A. I believe Piper and myself invented all that was new in that machine. It was made at our suggestion.

× *Q.* 107. When did you invent your machine?

A. In 1861 and 1862.

× *Q.* 108. Was that, or any other machine for this purpose, ever patented?

A. I think Kloman's was, in 1866, by Andrew Kloman. Sellers also got a patent for his machine.

× *Q.* 109. Did you or Piper ever apply for a patent for such a machine?

A. We did not.

Record, pp. 69, 70.

This testimony has been thus fully cited because it shows the reasons which induced the defendants below to abandon the pretence of prior invention, alleged in their answer; because it shows that Linville and Piper both communicated it to the officers of the Phœnix Iron Company, instead of obtaining the idea from them; and because it shows why the defendants ultimately resorted to the single defence that they had not *used* these upset eye-bars *in a bridge*, and therefore had not infringed.

This record shows that the upset eye-bars were a very decided improvement upon the forged, welded, or "jumped" bars previously made, and the answer of the defendants gives very strong testimony in support of the advantages of bars made by upsetting the ends.

"PHILADELPHIA, January 19th, 1863.

"J. H. LINVILLE, ESQ., C. E., Altoona, Pa.

"DEAR SIR,—Your dispatch of this morning with inquiry "about the price of links, etc., is duly to hand.

"*Respecting the plan upon which we propose to make links for* "*bridges, I beg to state that, inasmuch as we are preparing draw-* "*ings and specifications for letters patent, you will not feel offended* "*if I ask you, for the present, to excuse me from going into the details.* "We are so perfectly satisfied that it can be accomplished, that "I do not hesitate to make it a condition of the offer to supply, "that if you do not consider them entirely satisfactory, after "they are made, you will have the privilege of throwing them "on our hands. *The metal about the eyes will, I think, be both* "*denser and stronger, for equal sections, than the remaining* "*part of the bar. On one point I will speak for your satisfac-* "*tion,—that is, there is no cutting and no welding done in the* "*process of forming the eyes. In regard to price, we propose to* "*charge one cent per pound extra on the bar used, and each bar* "*will be required to be cut about one foot longer than the finished* "*link.* We shall be able to make them of any required dimen- "sions, say from four to twelve inches wide, and any lengths. "The price named applies to bars not shorter than ten feet. "*The thickness of the metal in the eye will be increased only a trifle* "*above the normal thickness of the bar in its other part.*

"As to the time when we could engage to make deliveries, "I think we can promise to furnish them as soon as you will "require them,—certainly much sooner than you can obtain "them from the forges. After rolling the bars there will be but "little time lost in finishing the links. I hope you will give "us the order, as I feel the most perfect assurance that you "will be satisfied with the work. *I have no hesitation in offer-* "*ing to guarantee that the links will be as strong and, at least, as* "*sound as any you can procure from the forges.* For the sake of "making the price fixed and absolute, I will say that we will "furnish them of undoubted quality, and subject to your ap- "proval and inspection, for six cents per lb., cash, F. O. B. cars "at the works.

"Very truly, yours,

"SAMUEL J. REEVES,

"*Vice-President.*"

Answer, p. 11.

The object and effect of this method of forming the eyes of the bars was to adapt them to the requirements of the improved construction of the lower chords described in the patent of 1862, by giving at the wide, thin-drilled eye of the bar a degree of strength equal, if not superior, to that of the bar at any point between the eyes, this upsetting process so condensing the metal and increasing its toughness and strength as to compensate for the reduction of its body by drilling the eye for the supporting-pin; the upsetting treatment giving this result, which is not attainable by forging or welding.

That this was a desideratum, and that the defendants, as manufacturers of bridge iron-work, were fully apprised of it, is evidenced by their answer in this cause, which claims that *they* invented it, and intended to patent it, intending to use this "invented article" for the very purpose claimed by appellant.

In view of the foregoing testimony, however, the defendants below of course abandoned the allegations of their answer as to their own priority of invention and their communication of it to the patentees, while the complainant below fully proved that this process of upsetting and this use of the upset bars was communicated fully by both Linville and Piper to the Phœnix Iron Company's superintendent, Mr. Sellers, before any pretended date of its conception by him or by Mr. Reeves.

Nor do the defendants controvert the value and advantage of these upset eye-bars, which are shown to have been far superior to those made by other processes—forging and welding. Mr. Lewis, the officer of the Pennsylvania Railroad Company, was satisfied that the upset bars were better than the ones that were welded (Szink, *A.* 7, *supra*, p. 22); they were better in several respects than those which had previously been made by lapping and welding, and by "jumping" pieces on to the sides of a straight bar to get the necessary enlargement (Piper, *A.* 39, *supra*, p. 28); and the defendants were so much elated with the superiority of these upset eye-bars that they "*proposed to charge "one cent per pound extra on the bar used*," and each bar required to be cut about a foot longer than the finished link. (S. J. Reeves' letter, Answer, p. 11, and *supra*, p. 39.)

The defendants made the eye-bars by upsetting, and furnished

these upset eye-bars to Kellogg, Clark & Co. for use in the La Salle bridge. (Linville, *supra*, p. 34.)

The sole point made below by the appellees in respect to this claim of the patent of 1865 was, that as they had only made the bars, and had not used them, they had not infringed the claim, which only comprised the *use in a bridge*.

But it is respectfully submitted that this is not the proper or fair construction of the third claim of the patent of 1865. The Circuit Court seems to have been misled by the argument for defendants, based upon the "disclaiming" clause of the specification, and really decided that the patentees had disclaimed everything except the right to use such eye-bars in bridges; whereas we contend that the only effect of the disclaiming paragraph is to discriminate the subject-matter of the claim—the thing made in the manner described,—that is, by upsetting the heated ends in moulds of the required shape for the purposes specified—from any peculiar or particular method or process of applying the requisite pressure.

Taking the specification relating to this part of the invention as a whole, we have

First. The statement that this is an improvement in the construction of the iron truss bridge described in the patent of 1862.

Second. That this improvement consists of the use of bottom chords of thin wrought-iron plates, the eye of which at each end, instead of being cut out of a rolled plate and drilled or forged into shape, is upset under strong compression, so as to give at the eye of the bar a degree of strength equal or superior to that of the bar at any point between the eyes.

Third. The location and connections of these bars in the construction of the bridge.

Fourth. The statement that these bars are made of wide, thin-rolled iron bars with enlarged ends, which are made by upsetting the rolled bars by compressing them into the desired shape in moulds into which the heated iron is forced under immense pressure, thereby increasing the density, toughness, and strength of the enlarged ends and permitting the holes or eyes

for the connecting-pins to be cut out without rendering the transverse section at the eye less than that of other parts of the bar or diminishing the transverse or longitudinal strength of the chord-bar.

Fifth. The statement that the patentees do not claim the upsetting of iron bars in the manner described, nor any peculiar mode of performing the operation of forcing the heated iron into the moulds, thus discriminating the subject-matter to be claimed from the greater body of the subject-matter comprised in the foregoing parts of the specification, disclaiming the upsetting of iron bars generally, and not including in their claim any peculiar mode of performing the operation of upsetting iron bars generally,—that is, not comprising in their claim the process of upsetting iron bars, but merely claiming the use of chord-bars for bridges, the eyes of which are thus formed so as to give additional strength to the bar where it is so much needed. And,

Sixth. The claim, more fully specific, to the use for the lower chords of truss-frames of wide- and thin-rolled bars with enlarged ends, formed by upsetting the iron, when heated, by compression into moulds of the required shape, for the purpose of increasing the density, toughness, and strength of the eye of the rod and enlarging the eye without diminishing its transverse strength, substantially as hereinbefore described.

This is a claim for a product in which the process inheres so far as that process characterizes the product and distinguishes it from the product of prior processes, in this instance from eye-bars the ends or eyes of which are enlarged by forging or welding instead of being compressed and upset in moulds.

Ames *vs.* Howard, 1 Sumner, 485, 488.

The opinion of the Court below cites only so much of the claim as stops at the word "shape," while the remainder of it materially modifies the first part, "for the purpose of increasing "the density, toughness, and strength *of the eye* of the rod *and* "*enlarging the eye* without diminishing *its* transverse section, "substantially as hereinbefore described."

The disclaimer is not so broad as stated by the Court. The exclusive right to make *chord-bars* in *any* mode is not dis-

claimed, nor is it declared that any one may make the *chord-bars in the manner described*, and that no encroachment upon their rights is committed until the bars are used by being put into a bridge.

Certainly the Court below could not rightly find in this disclaimer a license by the patentees to the public to make and sell these bars, without finding that license also to include the right to use them when thus made and sold by the licensees. If such be the true effect of the disclaimer, the Court below should have based its decree as to this claim upon the fact that the reserved right to *use* was inconsistent with the license to make and sell, and that the claim was therefore simply void, and should not have held that the defendants had not infringed the only right reserved, recognizing that as a tenable reservation.

And again, if a manufacturer who makes and sells a patented thing for the very use specified does not *use* the thing patented, and does not invade the rights secured by the grant of the patent, then a very large class of patentees must abandon all attempts to enjoin an unauthorized maker and vendor of his invention, and must resort to suits against individual users as the only infringers of his rights.

It is respectfully submitted that the Court below erred in its construction of this claim and in dismissing the bill thereupon.

III.

THE GRAVAMEN OF INFRINGEMENT UPON LETTERS PATENT OF THE UNITED STATES.

In both the patent of 1862 and the patent of 1865 the same words are used to define the grant or right secured by the patent: "These are therefore to grant, according to law, to "the said J. H. Linville and J. L. Piper, their heirs, adminis- "trators, or assigns, for the term of seventeen years from the "fourteenth day of January, one thousand eight hundred and "sixty-two (or the thirty-first day of October, one thousand "eight hundred and sixty-five), *the full and exclusive right and* "*liberty of making, constructing, using, and vending to others to be*

"*used, the said improvement, a description whereof is given in the* "*words of the said J. H. Linville* (*or of the said Linville and Piper*) "*in the schedule hereunto annexed, and is made a part of these* "*presents.*"

If the Court should accept the construction of the first claim of the patent of 1862, which has been submitted on behalf of the appellant, it can scarcely be doubted that the appellees must be held to have infringed that claim by making, constructing, and vending to Kellogg, Clark & Co., to be used in the La Salle bridge, the bases for the posts having the ribs projecting downwards for the insertion of the lower chords, and the eye-bars intended to be inserted between these ribs and fastened, all substantially as described in this patent.

It is well understood that a patentee may sue the maker, the vendor, or the user of an infringing machine. He may sue such parties separately or jointly; simultaneously or successively. He may sue the maker, who neither sells nor uses; or the vendor, who neither makes nor uses; or the user, who neither makes nor vends.

Curtis on Patents (4 Ed.), § 290.

Locomotive Engine Safety Truck Company *vs.* Erie Railway Company, 6 Fisher, 202.

And it has never been questioned that a patent was infringed where an order was given to the defendant by a third person to manufacture a patented article, on a plan or model furnished by a third person, and such order was executed.

Bryce *vs.* Dorr, 3 McLean, 582.

Wallace *vs.* Holmes, 9 Blatch., 65.

The bill in this cause charges that the defendants are using the patented improvements, are offering to construct bridges, and to manufacture posts for wrought-iron truss-frames to be employed in the construction of bridges, and are constructing lower chords of truss-frames for bridges in violation of these patents.

The answer does not deny that the defendants build bridges and parts of bridges; they only say that their mode of making and constructing bridges, posts, and truss-frames, and the parts and appurtenances thereof, is, in all substantial and material

respects, different from that described and claimed in said patents, except so far as they were invented by the defendants, or derived from prior publications; and Kellogg, Clark & Co., extensive contractors for and constructors of iron bridges, have for ten years past obtained all their iron bridge material from the defendants,—of course furnishing the defendants with the specifications as to shape, weight, length, and adaptation of parts necessary for making such iron-work.

It is respectfully submitted, that the defendants are sufficiently identified with the manufacture, or construction, use, and sale to others to be used, of the lower chords for the La Salle bridge to render them liable as infringers upon the second claim of the patent of 1862, and that the Court below erred in dismissing the bill as to this claim, as it erred in the construction of the claim itself.

Respecting the infringement of the third claim of the patent of 1865, it being proven—it not being denied—that the defendants had made, constructed, and vended to others to be used, for the lower chords of truss-frames, wide- and thin-rolled bars with enlarged ends, formed by upsetting the iron, when heated, by compression in moulds of the required shape, for the purpose of increasing the density, toughness, and strength of the eye of the rod, and enlarging the eye without diminishing its transverse section, substantially as described in the specification; it is respectfully submitted, that this patent covers the right to make such eye-bars for such use, and also the right to use them as articles of manufacture and sale, and also the right to sell them to others, for further use by the purchasers in bridge structures. It cannot be that the appellants' right under this patent only commences when the bars are in the bridge, any more than their right can be postponed until the bridge itself is used for trains or travellers. Such a construction of the grant would practically nullify the grant itself. It may be that Kellogg, Clark & Co. are further liable for further infringement of this claim, but no court has yet held that a manufacturer may make, construct, and sell to others to be used, the entire substance of the claim of a patent; may reap the profit of such manufacture and sale; may invite proposals

and make contracts for the thing patented, producing and delivering it in each case for the express use specified, and yet claim immunity, notwithstanding such concerted appropriation of the invention, upon the plea that he did not *use* the article *in* its designed place and to its ultimate employment.

A strong presentment of the contrary view is to be found in Judge Woodruff's opinion in Wallace *vs.* Holmes, above cited.

If the Court should hold the third claim of the patent of 1865 to be so narrow as to cover only the *use* of the eye-bars made as described, by an upsetting process, it is still insisted that the appellees have infringed the patent, because they have made and used, and sold to others to be used, the thing patented, and that the Court below, having found that "it is shown that "the bridge at La Salle, Illinois, was built by Kellogg, Clark "& Co., who obtained the iron for it from the respondents, "and that the bottom chords used in it were like those claimed "by the complainants," erred in finding that this proof of infringement falls short of fixing any accountability upon the respondents.

And it is respectfully submitted that the Court below erred in dismissing the bill as to this claim, as it erred in the construction of the claim itself.

IV.

It is respectfully submitted that the decree of the Court below should be reversed, and the cause remanded, with instructions to enter a decree for the complainant on the first claim of the patent of 1862, and on the third claim of the patent of 1865.

HENRY BALDWIN, JR.,
of Counsel for Appellant.

IN THE CIRCUIT COURT OF THE UNITED STATES IN AND FOR THE EASTERN DISTRICT OF PENNSYLVANIA, IN THE THIRD CIRCUIT.

THE KEYSTONE BRIDGE COMPANY *vs.* THE PHŒNIX IRON COMPANY.	No. 45. OCTOBER SESS., 1877.

MCKENNAN, *Circuit Judge.*

The opinion just read in the case of Reeves *vs.* The Keystone Bridge Company renders it unnecessary to consider the alleged infringement of the second claim of Linville's patent of 1862, and the first claim of the patent of Linville and Piper of 1865. The only claims of these patents which it is necessary to notice relate to the lower chord-bars of truss-bridge structures. It is in the use of these bars that the infringement is alleged to consist.

The first claim of the patent of 1862 is for the construction of the lower chords of truss bridges of series of eye-bars, wide- and thin-drilled eye-bars applied on edge between ribs on the bottom of the posts, etc. The form of the bars is of the essence of the claim, *wide* and *thin* bars only are claimed, and as the only proof of infringement is that the respondents made eye-bars *round* in sections, which were used in the La Salle bridge to perform the functions of tension-chords, the patent of 1862 may be dismissed from further consideration.

The third claim in the patent of 1865 is for "the use, for the "lower chords of truss-frames, of wide- and thin-rolled bars, with "enlarged ends, formed by upsetting the iron when heated by "compression into moulds of the required shape." As the respondents are proved to have made only round chord-bars, which were used in the La Salle structure, it may well be doubted that they have infringed this claim; and especially as they are not employed or adapted to give vertical support to the roadway,

which is an important function of the complainants' lower chords, and is the reason of their peculiar conformation. But waiving this, and assuming that the enlarged ends of the respondent's chord-bars are formed as described in the claim, it is not to be doubted that the patent is limited to the *use* of the chords in bridge structures. This is distinctly set forth in the specification, where it is stated that "we do not claim the up-"setting of bars in the manner described, nor any peculiar mode "of performing the operation, but merely the *use* of chord-bars "for bridges, the ties of which are thus formed so as to give "additional strength to the bar where it is so much needed."

The exclusive right to make chord-bars in any mode is distinctly disclaimed; only their use when formed as described is appropriated by the patentees and forbidden to others. They in effect declare that any one may lawfully make the bars, and that no encroachment upon their rights is committed until the bars are used by being put into a bridge.

Now, the respondents are iron manufacturers, and it is shown that the bridge at La Salle, Illinois, was built by Kellogg & Clark, who obtained the iron for it from the respondents, and that the bottom chords used in it were like those claimed by the complainants.

This is all the proof of infringement, and I think it falls far short of fixing any accountability upon the respondents. They made the bars, but did not use them; Kellogg and Clark did that. They did only what they had a legal right to do, and did not thereby assume any responsibility for the wrongful acts, or become involved in the unlawful purposes of others; nor can this responsibility be imposed upon them, because privity with a wrong-doer is not necessarily to be inferred from the exercise of a legal right.

My attention has been called to the opinion of Judge Woodruff in the case of Wallace & Sons *vs.* Holmes and others, reported in the Official Gazette of the Patent Office, vol. i. No. 6.

The case is a peculiar one. It involved the infringement of a patent for an improved lamp-burner in combination with a chimney,—where the respondents made and sold the burner alone, leaving the purchaser to supply the chimney, without

which such burner is useless,—and it was held that all who were engaged in the manufacture of the different parts of the combination and using it thereafter were infringers, for the reason that "all are tort feasors engaged in a common purpose "to infringe the patent, and actually, by their concerted action, "producing that result." Now, can it be doubted that, if the respondents there had been licensed by the patentee to make and sell his improved burner, and this was all they did, the result would have been different? And yet this is substantially the attitude of the respondents here.

By clear implication, the patentees have authorized the respondents to make and sell the chord-bars described in their patent, and have declared that only those who use them as lower chords in bridge construction can be called to account for infringement. Having, therefore, exercised the conceded rights of manufacturers only, the respondents cannot, by any strained inferences, be implicated in the wrongful acts of others.

The bill must, therefore, be dismissed with costs.

UNITED STATES OF AMERICA,
EASTERN DISTRICT OF PENNSYLVANIA. } *sct.*

I, Samuel Bell, Clerk of the Circuit Court of the United States of America, for the Eastern District of Pennsylvania, in the Third Circuit, do hereby certify the foregoing to be a true and faithful copy of the original opinion of Hon. William McKennan, Circuit Judge, in the case of The Keystone Bridge Company *vs.* the Phœnix Iron Company, No. 45, October Session, 1867, on file and now remaining among the records of the said Court in my office.

In testimony whereof I have hereunto subscribed my name and affixed the seal of the said Court, at Philadelphia, [SEAL.] this twenty-fourth day of September, in the year of our Lord one thousand eight hundred and seventy-seven, and of the independence of these United States the one hundred and second.

SAMUEL BELL, *Clerk of C. C.*

In The

Supreme Court of the United States.

Keystone Bridge Company,

vs.

The Phœnix Iron Company et al.

Argument for Appellees.

PHILADELPHIA:
F. C. MARKLEY & SON, PRINTERS, 422 LIBRARY STREET,
1874.

In The

Supreme Court of the United States.

Keystone Bridge Company,

vs.

The Phœnix Iron Company et al.

Argument for Appellees.

PHILADELPHIA:
E. C. MARKLEY & SON, PRINTERS, 422 LIBRARY STREET,
1874.

SUPREME COURT OF THE UNITED STATES.

KEYSTONE BRIDGE COMPANY,
Appellant,

vs.

THE PHŒNIX IRON COMPANY, *et al.*,
Appellees.

No. 81.

ARGUMENT OF GEORGE HARDING,

FOR APPELLEES.

The Bill of Complaint in this case charges, that the defendants (who, I may here observe, are engaged in the manufacture of iron, and do not build bridges) have infringed on the first and second claims of the patent granted to Linville & Piper, *assignees* of J. H. Linville, January 14, 1862; and on the first and third claims of the patent granted to Linville & Piper, *as joint inventors*, October 31, 1865.

The defence to these charges on the part of the defendants, is simply that they have not infringed these claims.

The first claim of the patent of 1862 is in these words:

First. "The construction of the lower chords of truss bridges of series of eye-bars *wide and thin*, drilled eye-bars C C, *applied on edge* between ribs S S, on the bottom of the posts, and connected by pins P P, supported in the diagonal tension braces D D and E, all substantially as herein described."

Neither Linville or Piper, or any member of the Keystone Bridge Co., was the inventor of the entire bridge; it is nothing more than the bridge with which the Court has been familiar for many years as the Whipple truss bridge, and which formerly consisted of top chords made of wood, and bottom tension pieces of iron, with a series of wooden struts interposed between the two, and diagonal tension rods of iron passing from the bottom of one to the top of another strut.

By degrees, iron was introduced into this kind of bridge as fast as it could be adapted thereto, and iron pieces were employed for top chords in the form of channel bars riveted together, and soon superseded the use of wooden top chords. Then they substituted cast iron posts or wrought iron upright bars, made of angle iron or L or T shaped iron bolted together in lieu of the vertical wooden struts. Eye bars, so much spoken of, soon came to be used for forming the tension chords at the bottom of this kind of bridges. The only invention or improvement which Linville himself claims as to these bottom eye-bars under his patent of 1862, is the formation of *wide* and *thin* eye-bars. The infringement of this patent is thus charged in the bill of complaint on page 2:

"The defendants have infringed also by the construction of the lower chords of truss frames for bridges out of wide and thin rolled bars of wrought iron, the eye end of which is enlarged and formed by upsetting, etc., * * * *."

This is the only charge of infringement, so far as relates to the eye-bars. The patent of 1862, I repeat, was merely for

wide and *thin* bars of wrought iron. The last clause of this charge of infringement, quoted by me, refers to the third clause of the patent of 1865, which concerns the mode of upsetting or forming the eye, of which I will not now speak.

The answer to this charge of infringement is: *First.* The defendants, being only iron workers, never built a bridge, and therefore never put any lower chords into a bridge.

Secondly. The only bridge which it is any way sought to be specifically connected with the defendants, is what is called the Lasalle Bridge. It is alluded to in the testimony of Mr. Linville. He says, p. [illegible], he learned from Clark and Kellogg, who were the builders of that bridge, that they obtained the iron work from the Phœnix Iron Company. Upon cross-examination, Linville admits that the lower chords were not *wide* and *thin* eye bars in that bridge, but that they were round in section. You will find this upon referring to Linville's cross-examination, X Q. 94, page [illegible], as follows:

"X Q. 94. Was not the whole body of those eye-bars, except the eye, round?

"A. It was."

The essence of the invention of Linville was this: He made use of his lower chords, both as a series of tensile chords and as a series of joists to support the flooring. To that end he made them wide and thin in the body. Kellogg and Clark, the builders of the Lasalle bridge, imposing no such function as supporting the floor upon their bottom chords in that bridge, those chords were made in the form proper for mere tensile chords, that is, round in the body and expanded at the extremity into an eye, for the purpose of receiving the bolt. The use of eye bars as bottom tensile chords, flat in section, with enlarged ends for eyes, however, was old. Here is the bridge of the Newark Dyke, which is in evidence; I refer to plates nine and ten. Your Honor will perceive the sections or side views of the lower chords, or what are called eye bars.

The difference between Linville's patented bar and the Newark eye bar is that Linville's eye bar is wider and thinner

in its body, and has therefore more the appearance in section of a joist.

By referring to plate eight, in the same book, you will perceive a pin passing through the bottom of the post, so that at each end of the pins an end of an eye bar is fastened, thus arranging the series of eye bars on each side of the posts at the bottom, producing the balancing spoken of by my adversary in his argument.

Nothing, however, is said from the beginning to the end of Linville's specification about *his* eye bars being so arranged at the bottom of the posts, as to produce a counteracting or balancing effect, or that *he deemed* that any such effect was useful or important.[1]

As to the new function which Linville imparted to his eye bars, it is not in proof that in the Lasalle bridge the eye bars did bear up the floors; and Linville, as above quoted, admitted that they were of the shape of mere tension rods, viz., round in section in the body.

Linville's improved mode of supporting the floor by the lower chords, I may state to your Honor, was carried out in the arsenal bridge over the Schuylkill River, and I think that bridge remains to this day as a solitary monument of that mode of bridge building.

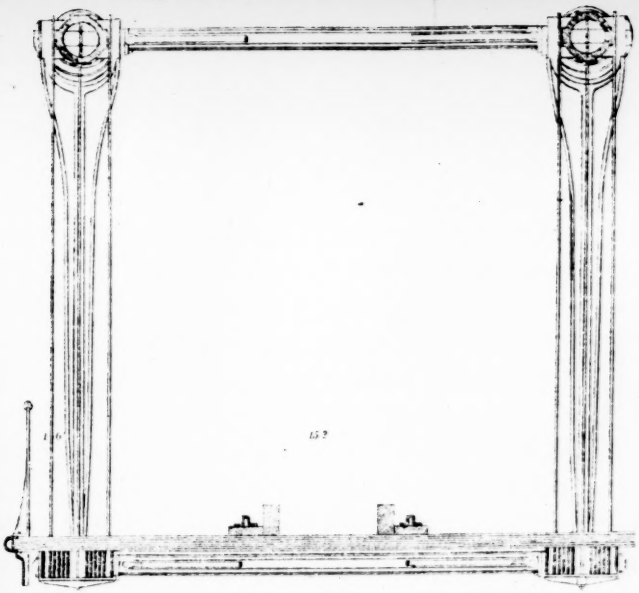
The approved plan, now universally used, is to place cross pieces at the bottom of the posts and secure them transversely

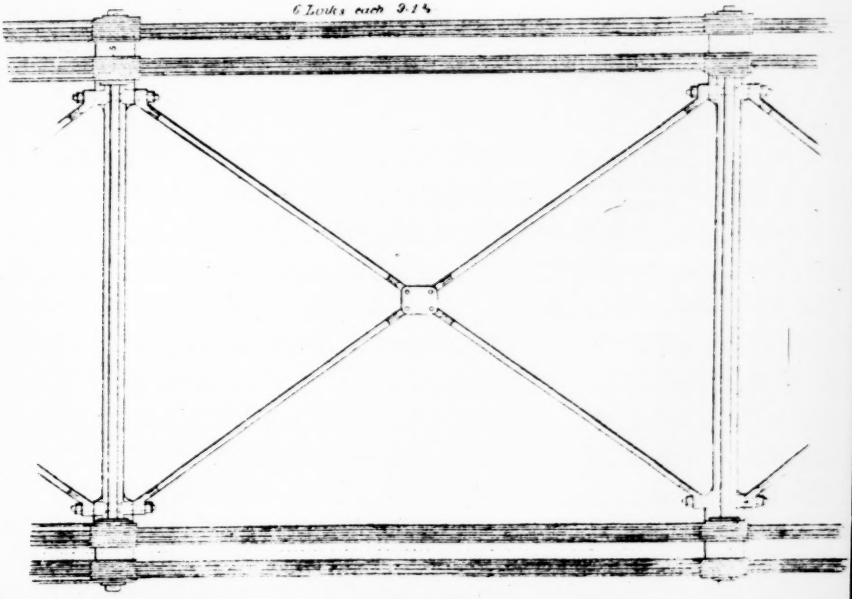
[1] *Extracts from Linville's specification* 1862.

"The bottom chords, c c, are each composed of a series of *wide thin* eye bars of wrought iron, of a length corresponding with the distances between the posts on one side of the truss, *placed on edge to enable them to give vertical support to the roadway*, and fitted outside of the bases L L of the posts, and between ribs S S formed on said bases, as shown in figures 2 and 4."

* * * * * * * * * * * *

"The said chords, the ribs S S, and the diagonal rods D D, and E, are so disposed and distributed as to obviate all danger of bending the connecting pins P P, which can only yield by being sheared off by the tensile strain on the chords and diagonals; and the chords being thus well supported at short intervals *support the floor beams and track without the employment of auxiliary beams for this purpose.*"

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at their ends to the bottom of the posts, and then place longitudinal pieces to receive the flooring on top of the transverse pieces. This causes the load to be suspended directly on the upper or main chords, which was always designed to receive it under this plan or theory of bridge building.

The lower chords in the Lasalle bridge thus perform no other function than to resist the rending or tensile strain lengthwise on the bridge, and the floor is supported by the top chords in the Lasalle bridge, in the manner last described, and there is no pretence that any other use was ever made by the defendants, of the lower chords.

The defendants never *made* any *wide and thin bars* of wrought iron, or, in other words, bars of wrought iron that had the shape or sectional form of a joist, or that were intended to perform the function of a joist, or any other function than that of mere tensile rods.

I might, however, have rested with my opening proposition, viz., that these defendants never made a bridge, and of course never put any bottom chords into one, and with that remark I dispose of the alleged infringement of the first claim of Linville's patent of 1862.

INFRINGEMENT OF THIRD CLAIM OF PATENT OF 1865.

As to the charge of infringement of the third claim of the patent of 1865 (of Linville & Piper), which consists in the formation of the eye-bar by upsetting the iron at the ends, the defendants' case is this:

These eye-bars have long been formed by being upset at the end where the pin goes through; they were so formed in the Newark Dyke Bridge, and they must always be so formed in order to secure sufficient width at the end to prevent the breaking out of the eye by the pin.

The Court is aware ~~Your Honor is enough of a blacksmith to know~~ that there are a variety of ways resorted to, for this and similar purposes.

The ordinary mode is to take a bar of iron of uniform diameter, heat it, strike it on the end to force back the iron and

thicken it, then lay it on its side and flatten it by blows of the hammer; and then drive a hole through with the mandril.

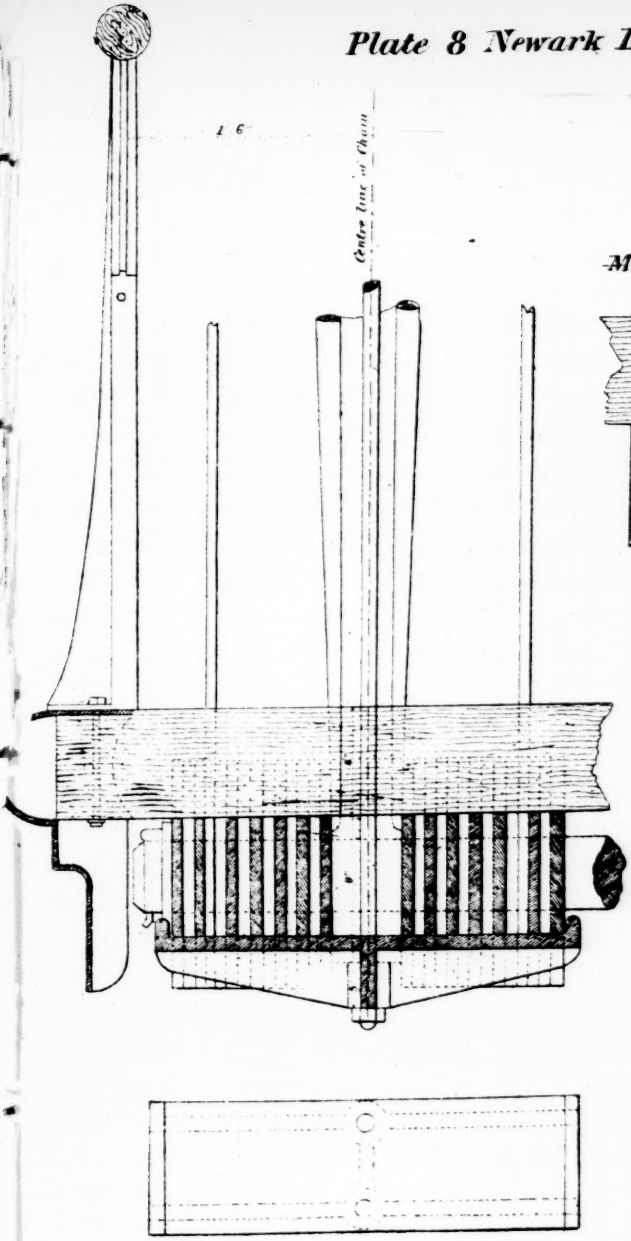
That is the obvious common sense way of doing it. When the blacksmith strikes the heated bar on the end he forces back the iron into the body and he upsets it, and that is the whole mystery of upsetting.

Linville & Piper sought, by *a single operation,* to upset the heated iron bar at its end and shape up the entire contour of the end of the eye bar. They devised a machine which they exhibited here.

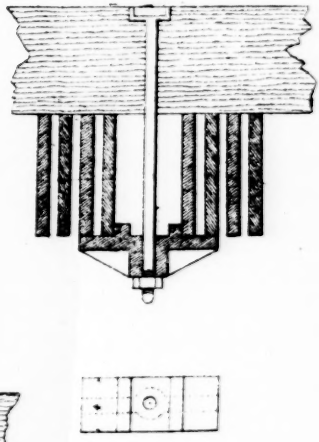
Figure 1 represents a bar of iron brought to the proper thickness and width for the body of the eye bar and the required thickness for the eye part. Figure 2 represents the plaintiff's upsetting mould. B is a cavity of the exact shape and thickness of the body of the bar. C is a continuation of the cavity B, having the same thickness or depth, but having its lateral contour made exactly to the shape of the eye part to be formed. D is a sliding follower which can be forced by a screw E in the direction of the arrow a. The lid F, when closed down and firmly secured, holds the bar A in place, and prevents the iron from being forced upwards when the pressure is applied by the follower to the end of the heated bar A. The follower, it will be observed, is shaped at G, so as to correspond with the contour of the end of the eye bar to be formed. Figure 3 represents the finished bar.

The Court will perceive that Linville & Piper rolled the iron of the requisite thickness and width; they then put it into a sort of mould while at a welding heat; they then closed and fastened down the cover; then (when they succeeded in getting power enough, which appears to have been very seldom), they would force the iron endwise by a follower into shape. Thus by a single operation they aimed to upset and form the eye piece or head of the bar. After having made some few of them, Linville & Piper had to give it up on account of the difficulty of obtaining sufficient pressure endwise on the bar to perform the work. (See testimony page 45.)

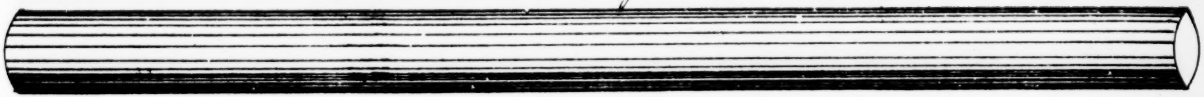
Plate 8 Newark Dyke Bridge



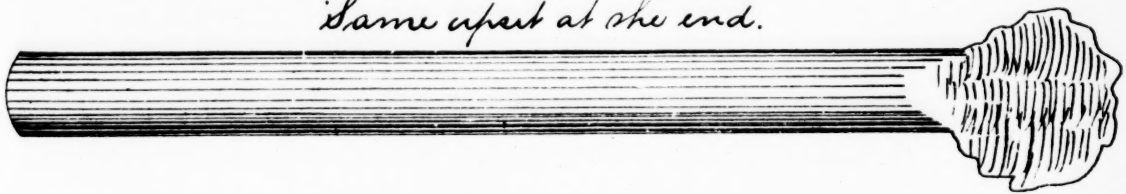
Mode of securing Platform to chain



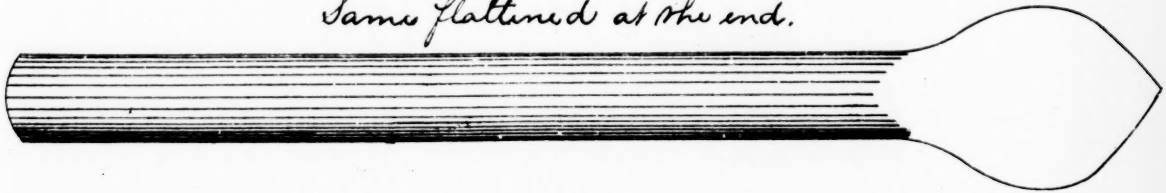
Reeves' bar in its original condition.



Same upset at the end.



Same flattened at the end.



"*Upsetting,*" is a technical term, and may be defined as applying pressure to the end of a bar of metal at welding heat in order to force the fibre backwards so as to spread transversely to the direction of the pressure applied. Thus, it is, the head is made on forged nails or bolts.

The process performed in Linville's machine consists in restraining the metal above by the closed lid, and forcing the mass back endwise in the direction of the arrow a, so as to cause the heated mass to spread laterally in the direction of the arrows b, b, b, until it reaches the wall or boundary of the cavity C.

Now defendants make their eye bars as Reeves describes in his testimony (page 80), in the following way: They take a bar of iron as shown at W, and thicken the end of the rod on which they are going to make their eye piece by striking the rod while heated on its head, or by driving it on the head by a ram, until they have upset it and formed a thick ball of iron at one end as shown at X, no mould or die whatever being used in this first operation; they then use a die, into which they put this thickened end and flatten it into shape, shown at Z, by pressing from above, the same as a coin is struck into shape. The defendants have no apparatus which forms the eye either at one operation or by upsetting, but they proceed just as the blacksmith did when he struck the heated bar on the end before flattening the end for the eye.

The defendants, moreover, do not put even these eye bars into bridges, but merely make and sell them as merchandise. The plaintiffs make no claim and cannot charge anybody who merely *makes* these eye bars with being an infringer, for in their patent of 1865, occurs this language:

"We *do not claim the upsetting of bars* in the manner described," * * * They say we do not claim the upsetting of bars in the manner described, nor any peculiar mode of performing the operation, but merely the use of chord bars for bridges, the eyes of which are thus formed, so as to give additional strength for the bar where it is so much needed. They

have been kind enough to admit this on page 7 of the patent of 1865.

In the first place, you observe, they describe no way by which the thing is to be done at all. It is a most remarkable description.

The full description is in the second paragraph at the bottom of page 7, as follows:

"The lower chords D consist of wide thin rolled iron bars, with "enlarged ends, which are made by *upsetting* the rolled bars by "compressing them into the desired shape in moulds into which "the heated iron is forced *under immense pressure*, thereby in- "creasing the density, toughness and strength of the enlarged "ends, and permitting the holes or eyes for the connecting "pins N, to be cut out without rendering the transverse sec- "tion at the eye less than that of other parts of the bar, or "diminishing the transverse or longitudinal strength of the "chord bar."

I have shown the instrument illustrating plaintiffs' process, in which they undertook to upset in a mould. If they did it, they are the only persons whoever did it or ever will desire to do it. They have devised a mould, they say, in which iron could be upset; the marked feature of which invention is the enormous pressure which is required to perform the operation. The language of their specification is "under immense pressure." The use of dies for shaping iron, they would not pretend to claim. Every piece of malleable iron is formed into shape by the practical process of being heated and pressed in a mould; and these gentlemen, therefore, only claim to *upset* iron while *in a mould*, which Mr. Reeves testifies that defendant does not do.

~~Court. I understand you to say, however, he has the right to do that, if he does not use the eye bar so made.~~

~~Mr. Harding. Most undoubtedly.~~ Linville & Piper, in their specification of 1865, do not tell us how the eye bar is to be upset into shape. They tell us as much as this: Go and find out how to upset it in a mould, and when you have found out

Fig. 3.

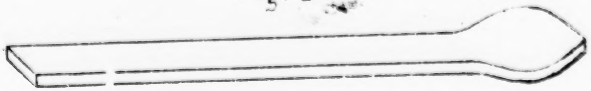


Fig. 2.

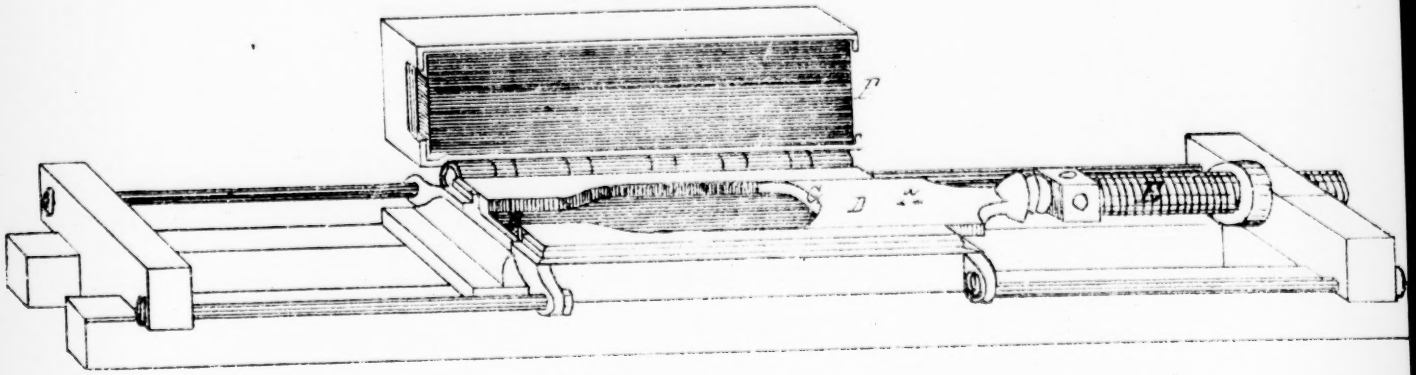


Fig. 1.

how to do it we will tell you that you have infringed our patent. That is where they meet us. Then they come and make this claim—this strange claim. They say we don't claim this method of upsetting eye bars; we don't claim it generally or particularly, but only *when it is made use of by putting it into a bridge;* and they have not proved that defendants have ever put an eye bar into a bridge, only that Mr. Linville says that, having been at Lasalle, he saw Kellogg and Clark putting eye bars into a bridge, which, from the general appearance, looked as though they had been made in this way, and that he learned, on inquiry, that they got the iron of Mr. R p
alone based this charge of infringement. (S T
mony, p. 74, q. [redacted] e

The words of their claim are: "The i
chords of truss frames of *wide* and thin rol a
larged ends formed by upsetting the iron wh i
pression into moulds of the required shape f l
increasing the toughness, etc." i

How can a company which never made a tr c
on their claim? I do not think it is necessa t
[redacted] on this point further. If this claim c t
invention, which they intended to cover, it is their business to make their patent what it ought to be, and then come before the Court.

INFRINGEMENT OF SECOND CLAIM OF PATENT OF 1862, AND THIRD CLAIM OF PATENT 1865.

The remaining charge of infringement is made on the second claim of the patent of 1862, in connection with the first claim of their patent of 1865. It is difficult to learn from the complainant's bill which of these specifications the defendants are charged with infringing. The position argued here is, that the patent of 1862 contained the germ or fundamental basis of the hollow posts, but it was fully patented in 1865. That claim they say we have infringed, and as this is the main point under consideration, I have reserved the consideration of it to the last. As to the infringement of the second claim of the patent

of 1862, I deny that defendants have infringed that. It is a claim for a combination for a post composed of the pieces O, A, L, with intermediate pieces, and fastened with rivets, and with a top and bottom piece as described. The opening part of the specification describes the invention to consist in the making of a post of "*wrought and cast-iron.*" It then proceeds to describe that there are to be two bars made of wrought iron; that in one form the bar is to be octagonal in section; that inside there is to be an octagonal-shaped piece placed between the two similar octagonal sections. Having so placed that separation piece, a bolt or rivet is to be passed from one side to the other. The posts so made are to be taken bodily to the foundry; one end of it is to be immersed in a flask and molten iron cast upon it to form the base, and then it is to be turned upside down and iron cast upon it in like manner to form the capital. The iron so cast at bottom and top, as it cools, surrounding and binding together the parts, just as the tire of the wagon wheel in cooling binds together its component parts; then, the specification says, the post is complete. It appears, by the proofs, that when this top or bottom breaks off they must take back the post to the foundry, and have a new bottom or top cast onto it. It is thus they make an organized post, and that is the thing described and the thing claimed. A great deal has been said about the hollow post principle, for which there is no authority in the patent of 1862. Linville says this post O, A, L, may be either polygonal in sections, octagonal in sections, or they may be L shaped, or they may be T shaped. But, says the patent, you have got to have three things in it. You must have the two bars, whether T shaped or L shaped, or circular or polygonal in sections. Second. You must have distension pieces to keep them apart in the middle of their length. Thirdly. You must have transverse bolts or rivets to keep them together; and Fourthly. You must cast an iron piece onto the bottom, and another iron piece, as a capital onto it at the top. That makes up the organized post, which is the invention. From the beginning to the end there is not one word

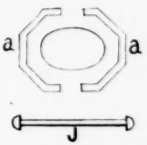
about the importance of a hollow post—not one word about the iron being removed from the centre to the circumference. On the contrary, two alternative forms of bars are described (L and T shapes), in which the whole mass of iron is thrown to the centre.

To show that I do not mistake this matter I will read from the specification of the patent of 1862.

"My invention consists in the novel construction of the posts of wrought and cast iron." * * * *

"The principal portions A A, of the posts O A L, O A L, each consist of two rolled plates of wrought iron a a (see Figures 2 and 5), of semi-octagonal or other semi-polygonal form, in their transverse section secured at intervals by rivets J J, *or by bands shrunk around them binding them firmly to the filling or distance pieces b*, which are placed between them at suitable distances apart. The said plates a a, are close together at top and bottom, but sprung apart at the middle of their length to render them capable of resisting a greater compressive force, and to allow the diagonal counter braces E E, to pass through the posts without cutting away any of the material. *The posts are completed by casting around the wrought iron portion A*, the bases L, and capitals O, of any desired shape. The wrought iron portion A, may also be constructed of two semi-circular, T or L shaped sections, sprung apart, connected together and terminating *in cast bases* and capitals in a manner similar to the two semi-polygonal pieces a a. The advantage of this construction of the posts, besides that of allowing the counter braces to pass through them without their being weakened by cutting away the metal is, that they are more flexible than cast iron posts, and less liable to injury by shocks. * *

Plates a, a, & rivets J, J.



Distance pieces b.

Bases L.

Capitals O.

From the beginning to the end, I repeat there is not a hint of the importance of the hollow post principle.

There is no proof that defendants ever made a combined post

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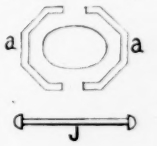
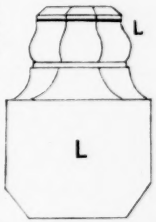


Distance pieces b.

Bases L.



Capitals O.

From the beginning to the end, I repeat there is not a hint of the importance of the hollow post principle.

There is no proof that defendants ever made a combined post

of that kind. There is no proof that any one but the plaintiffs ever made a post of that kind. Their bridge on the Schuylkill contains the first, the last, and the only specimen of it which ever did or probably ever will exist. Complainant's counsel say that bridge has never dropped to pieces or let a locomotive fall, and that it has been there ever since 1862.

Your Honor is aware that bridges are not used to the ultimate limit they will bear, but are as a rule constructed at least four times stronger than the strain to which they are ordinarily subjected. That one bridge has stood as long a time as another establishes no comparative criterion of the strength of the two bridges. The only way is to put them to the comparative test of crushing them. Then you can determine.

The first claim of the patent of 1865 is as follows:

1st. The use of the posts, for wrought iron truss frames having a curved or polygonal section, composed of two or more plates of rolled or wrought iron *with flanged edges secured together by means of rivets passing through such flanges, and through ferrules interposed between them, to give any desired enlargement to the posts, and leave space for the passage of the counter braces without cutting away or weakening the post;* such posts being completed with by bases and capitals wrought or cast iron *riveted* thereto, substantially as and for the purposes hereinbefore mentioned.

The invention is thus set out in the body of the patent:

1st. The posts instead of being made of two rolled plates of iron of semi-polygonal transverse section, united by rivets passed through the centre of the polygon and spring apart by distant plates, are made of two or more plates of wrought iron with flanges at the edge, the plates being so united as to make hollow points, by rivets passed through the flanges, and *each plate being arched longitudinally, by means of ferrules* placed at intervals between the flanges and around the rivets. And instead *of casting the bases and capitals* on the ends of the posts, *we use bases and capitals connected* by rivets to the posts.

This invention is merely the taking of Reeves' post of 1862,

and swelling it at the middle by ferrules, and completing the post by rivetting bases and capitals of wrought iron to it. The defendants never have swelled their posts or made use of ferrules or caps and bases riveted to their columns.

In the annexed figure is shown the Reeves post and the Linville post of 1862, and the Linville & Piper post of 1865.

There is no proof whatever that we ever made a post having these elements combined together, and, therefore, I submit that so far as infringement under the second claim of the patent of 1862, or the third claim of 1865, is concerned, the matter need be no further discussed.

SPECIFICATION OF PATENT OF J. H. LINVILLE, ANNEXED TO LETTERS PATENT GRANTED TO LINVILLE & PIPER, ASSIGNEES OF J. H. LINVILLE, JANUARY 14, 1862.

THE SCHEDULE REFERRED TO IN THESE LETTERS PATENT, AND MAKING PART OF THE SAME.

To all whom it may concern:

BE IT KNOWN that I, J. H. Linville, of Altoona, in the County of Blair, and State of Pennsylvania, have invented a new and useful Improvement in Iron Truss Bridges, and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings forming part of this specification, in which

Figure 1 is a side elevation of two panels of a truss bridge constructed according to my invention.

Figure 2 is a transverse vertical section of the same.

Figure 3 is a plan of the top chords and lateral braces.

Figure 4 is a plan of the bottom chords and lateral braces.

Figure 5 is a horizontal section of one of the posts.

Similar letters of reference indicate corresponding parts in the several Figures.

My invention consists: 1st, in a novel construction of the lower chords and mode of applying the same, in combination with the posts and other parts of the truss; 2d, in a novel construction of the posts of wrought and cast-iron. To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation. O A L, O A L, are the posts; B B, the sections of the top chords; C C, the sections of the bottom chords; D D, the diagonal tension braces or suspension rods; E E, counter diagonal tension braces; F F, lateral struts between the top chords; G G, lateral

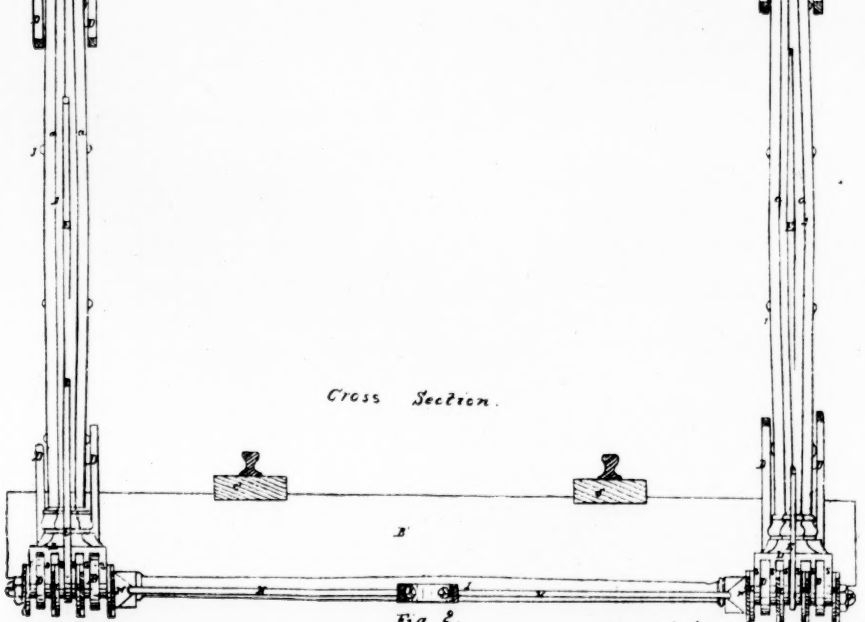


Fig 2.

J. H. Linville
per Munn & Co
Attorneys

J. H. Linville Design for An Iron Truss Bridge

Patented Jan 6th 1862

No. 34 183

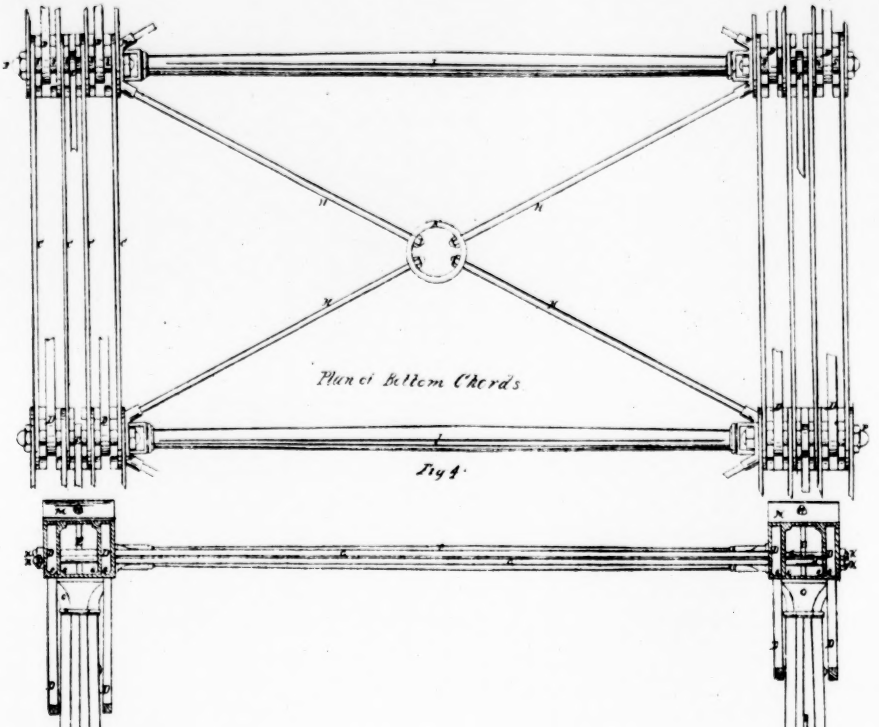


Fig 4.

diagonal tension braces between said chords; I I, transverse struts between the lower chords and lower ends of the posts H H, lateral diagonal tension braces between the lower chords and lower ends of the posts; B^1 B^1, floor beams; C^1 C^1, longitudinal timbers supporting tracks.

The bottom chords C C, are each composed of a series of wide thin eye bars of wrought iron, of a length corresponding with the distances between the posts on one side of the truss, placed on edge, to enable them to give vertical support to the roadway, and fitted outside of the bases L L, of the posts, and between ribs S S, formed on said bases, as shown in Figures 2 and 4.

The bars C are extended in width at their ends, and drilled to receive connecting pins P P, one at the base of each post, the said pins passing through the said ribs S S, and being supported by the suspension bars D D, which, as well as the counter diagonals E E, are also fited between other and similar ribs S S, the lower ends of the said bars being made with eyes for the reception of the said pins. The said chords, the ribs S S, and the diagonal rods D D, and E, are so disposed or distributed as to obviate all danger of bending the connecting pins P P, which can only yield by being sheared off by the tensile strain on the chords and diagonals; and the chords being thus well supported at short intervals, support the floor beams and track, without the employment of auxiliary beams for this purpose. The principal portions A A, of the posts O A L, O A L, each consist of two rolled plates of wrought iron a a, (see Figures 2 and 5), of semi-octagonal or other semi-polygonal form in their transverse section secured at intervals by rivets J J, or by bands shrunk around them, binding them firmly to the filling or distance pieces b, which are placed between them at suitable distances apart. The said plates a a, are close together at top and bottom, but sprung apart at the middle of their length, to render them capable of resisting a greater compressive force, and to allow the diagonal counter braces E E, to pass through the posts without cutting away any of the material. The posts are

completed by casting around the wrought iron portion A, the bases L, and capitals O, of any desired shape. The wrought-iron portion A, may also be constructed of two semi-circular, T or L shaped sections, sprung apart, connected together and terminating in cast bases and capitals in a manner similar to the two semi-polyginal pieces a a. The advantage of this construction of the posts, besides that of allowing the counter braces to pass through them without their being weakened by cutting away the metal, is that they are more flexible than cast iron posts, and less liable to injury by shocks.

The upper chords B B, are made of cast iron, in sections of a length equal to the distances between the centres of the posts, said sections having the central portions made of octagonal or other polygonal, or circular form in their transverse section, and terminating in rectangular form with mid-ribs R R, (see Figure 2,) at their ends, which abut together over the posts, to resist the vertical crushing strain, resulting from the action of the diagonals, and afford a greater abutting surface to resist and distribute the horizontal compression of the top chord. These mid-ribs and the outside plate of the chord, pass through guides e e, on the top plates of the posts, and are thus maintained in line and position. The unusual width given to the abutting ends of the sections of the top chords, increases the lateral stiffness of the chords, and allows the tension rods D D, in doubled cancelled trusses, to pass outside of the posts, and at sufficient distance apart to admit of screws and nuts on the ends of the said rods for the purpose of adjustment. The several sections of the top chords may be formed of wrought iron with cast iron ends, in the same manner as the posts O A L, O A L. M M, are angle blocks placed over the joints of the sections of the top chord, and between guide pieces d d, provided thereon, to form bearings for the nuts f f, which are fitted to the screws of the said rods.

The upper lateral struts F F, of cast iron, rest in pockets or bearings in the sides of the top chords. The lateral rods G G,

pass through the chords, and are tightened by nuts K K, turning against angle bosses Z Z, on the outside of the chords. When the bridge consists of three trusses, the bosses Z Z, are used on both sides of the chords of the centre buss, as shown at the right hand side of Figure 3, a jam nut being used at one side of the truss, and a sleeve nut V, on the other side for the two-fold purpose of adjusting the lateral rod Y of the third truss, in such manner that the two systems of lateral bracing may act independently of each other, which is an advantage in the raising of the bridge, and also in its subsequent use. Besides this advantage it—this system of bracing, obviates the the necessity of passing all the rods through the chords. The lower lateral tension braces H H, consist of short rods connected (as shown in Figure 4,) midway between the two trusses, with a ring A^1, and also connected with plates N N, through which the connecting pins P P, of the lower chords pass, the said plates being interposed between the lower chords and the ends of the cast iron struts I I, and being secured to the lower chords and bosses of the posts by means of the nuts on the outer ends of the said pins P P. The said rods may be either tapped into the ends of the plates N N, as represented or attached by eyes. The lateral struts have each a concave opening in the lower parts of their ends to drop over the connecting pin, and they should bear upon the plates N N. These plates transmit the strain from the rods H H to the struts I I, without straining the ribs S S, of the bases of the posts.

I do not claim the use of eye-bars or links as chains of suspension bridges, or as tension braces of truss bridges. But what I claim as my invention, and desire to secure by Letters Patent, is, First, The construction of the lower chords of truss bridges of series of eye-bars, wide and thin, drilled eye-bars "C C, applied on edge between ribs S S, on the bottoms of the posts, and connected by pins P P, supported in the diagonal tension braces D D, and E, all substantially as herein described. Second, The posts O A L, O A L, composed each of two wrought

iron plates or bars a a, distance pieces b b, and rivets J J, or their equivalents, and cast iron bases L L, and capitals O O, the whole combined as herein specified.

J. H. LINVILLE.

Witnesses:

Jos. M. Wilson,
W. B. Wilson.

Specification of Samuel J. Reeves' Patent, granted June 17, 1862.

THE SCHEDULE REFERRED TO IN THESE LETTERS-PATENT, AND MAKING PART OF THE SAME.

To all whom it may concern:

Be it known that I, Samuel J. Reeves, of the City and County of Philadelphia, and the State of Pennsylvania, have invented certain new and useful improvements in the construction of Wrought-Iron Shafts or Columns, Braces or Chords, for Houses, Piers, Bridges, &c., and that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which

Fig. 1 represents a shaft or column, partially in section.

Fig. 2 represents a transverse section through the same.

Fig. 3 represents a portion of the transverse section on an enlarged scale.

Fig. 4 represents a transverse section of a column in a modified form.

I have invented a novel mode of making a shaft or column of wrought-iron, which combines the advantage of being useful as a vertical post, horizontal brace, or compression chord, in the construction of houses, piers, bridges and other structures; and, at the same time admitting (where several of them are to be used together to form a truss, as in a bridge, pier, or observatory) of a convenient and cheap arrangement for fastening the ties and braces.

I use three or more wrought-iron bars, similar to those marked *a*, *a*, *a*, *a*, in the annexed drawing, to which reference is hereby made, of such shapes and dimensions so that when arranged together in the direction of their length, and fastened by rivets or bolts *c*, through their flanges *b*, they shall form a hollow shaft or column. When it is intended to use two or more of these shafts in combination with ties or braces, instead of bringing the flanges in contact with each other, I interpose washers of any desired thickness, for the purpose of admitting the ends of the ties and braces between the flanges, and for riveting or bolting them together; thus uniting the whole in the most suitable manner and at small expense.

The pieces *a*, *a*, *a*, *a*, are so designed that they can be rolled, by raising or depressing the rollers to any desired thickness, without increasing the external diameter of the column proposed to be made; so that a series of columns, resting one upon another, may be made of different interior diameters and weights, proportioned to the loads to be sustained, but having the external appearance of one uniform shaft.

The stiffness and strength of columns, made in this manner, may be increased at a very moderate expense by setting plain bars of iron between the flanges of the bars *a*, *a*, *a*, *a*, and riveted to them, and extending outward from the centre; thus, in effect, increasing the diameter of the column.

What I claim, and desire to secure by Letters Patent is: The uniting together three or more pieces of wrought-iron, made

with flanges in the direction of their length, so that they shall form a column or shaft, to be used as posts, and also as braces, or compression chords, in the construction of buildings, bridges, piers, or other structures.

SAMUEL J. REEVES.

Witnesses:
GEORGE GERRY WHITE,
R. LLOYD LEE.

SPECIFICATION OF LETTERS PATENT NO. 50,723 TO JACOB H. LINVILLE AND JOHN L. PIPER, OCTOBER 31st, 1865.

To all whom it may concern:

BE IT KNOWN, That we, Jacob H. Linville, of Pittsburg, in the County of Allegheny and State of Pennsylvania, and John L. Piper, of Altoona, in the County of Blair and State of Pennsylvania, have invented a new and useful Improvement in Wrought-Iron Bridges, or other truss frames; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming part of this specification, in which

Figure 1 is a side elevation of two panels of a wrought-iron truss bridge, with double intersecting diagonal tension bars.

Figure 2 is a transverse section of the same.

Figure 3 is a side elevation of the wrought-iron upper chord.

Figure 4 is a top view of the same.

Figure 5 is a transverse section of the upper chord, through the centre of the angle block in the plane of the centre of the post s.

Figure 6 is a horizontal section through the base of the post and lower chord bars.

Figure 7 is an end view of the wrought-iron base of the post.

Samuel J Ree

Construction of Wrought-Iron

No 35.582

Fig 4

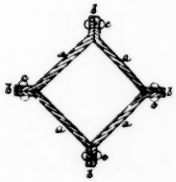
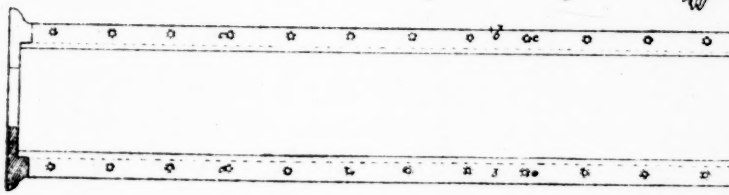


Fig 1



Witnesses:
Henry W Bree
John Mathys

Reeves

Iron Shafts or Columns

Patented June 17. 1862

Fig 3

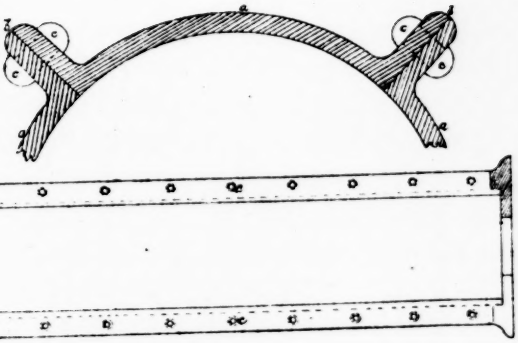


Fig 2

Inventor
Samuel J Reeves
By Atty
A B Stoughton

in section in figure 5.) These angle blocks form the upper bearing of the nuts n^2 at the ends of the tension braces E, and the counter tension braces F, which support the bridge. Each tension brace E starts from the angle block I at top of one post, passes through the upper chord, and downwards diagonally, passing outside of the next post, crossing it at midway from its top and bottom, and thence extends to the bottom of the third post, where a loop or eye at the end of the brace E receives the connecting pin N; two such braces E being used side by side, one passing on each side of the posts A. The counter tension braces F (which run diagonally in the opposite direction to the braces E), start from the angle block I at top of each post A, pass through the upper chord B, and thence through the centre of the next or second post; and thence to the bottom of the third post, where the connecting pin N passes through the eye or loop at the lower extremity of the counter brace F.

The road-way is composed of sills f, placed transversely on top of the lower chord bars D, and the string pieces g, which sustain the rails i, are placed longitudinally on the sills, as shown in figure 1; or if a deck bridge is required, the sills f are placed on the top of the upper chords B, as shown by dotted lines in figure 1.

Having this described the general construction and arrangement of our bridge, we will proceed to explain more minutely the peculiar features of the posts, upper chords and lower chords.

The posts consist of three principal parts, the shaft, the base, and the capital. The shaft is made of pieces of rolled iron, k, of sufficient length to extend from the top of the capital to the base. In the drawing, these posts are represented as made of four such pieces of iron, but the number is not material, as two would suffice if they are bent or curved so as to form a hollow post. The edges of these pieces k, are turned outward so as to form a flange on each edge.

Instead of uniting these pieces or plates k, by bringing the

flanges together, they are separated by ferrules *l*, or small tubes, of sufficient diameter to receive the rivets *s*. These ferrules are placed between the opposite flanges of the plates *k*, and then a rivet *s* passed through the flanges and ferrule, and fastened in the usual manner by upsetting, unites them finally.

The length of the ferrules *l* determines the distance between the opposite faces of the flanges; this distance being greatest at the centre of the post, and gradually diminishing towards each end, thus making the post *A* thickest in the middle. The capital and base may be made of wrought or cast iron, but we prefer the former as less liable to fracture. The capital consists of a cap plate *m*, placed on top and riveted to the post, and supported by brackets *n*, of wrought-iron placed between the flanges of the plates *k* composing the posts, in place of the ferrules, and also riveted to the flanges of the plate *k*.

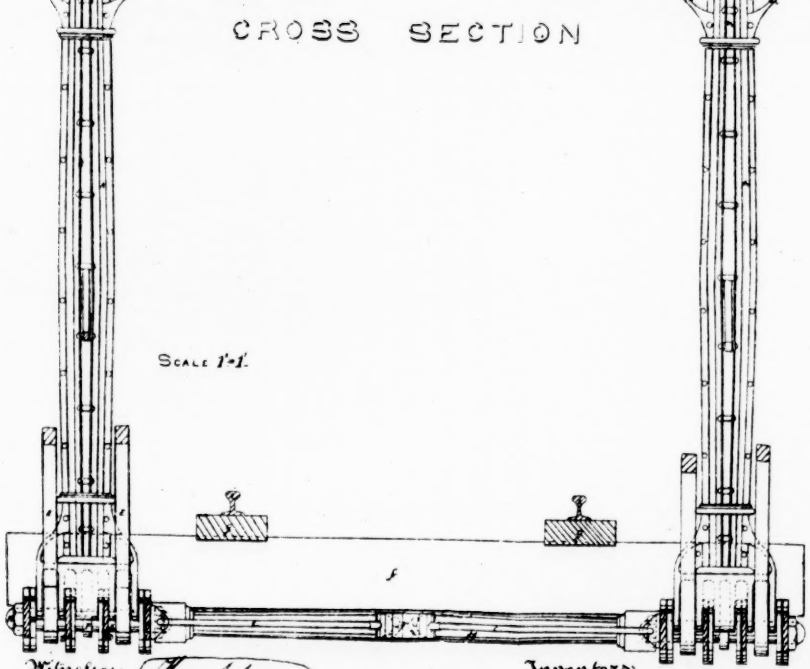
The bases are made in the same manner; a base plate *p* (see figure 7), being united to the plates *k* of the post by brackets n^1 passing between the flanges of the plates and riveted thereto.

The ends of the base plate *p* (which may also be made of wrought-iron) are turned down forming ribs *t* (see figure 7), and intermediate or mid ribs t^1 t^1, are added between the ribs *t t*, by riveting to the under side of the base plate. These ribs *t*, and mid ribs t^1 have semi-circular notches cut in them (as seen in figure 8), so as to straddle the connecting pin *N*, and they serve to separate and keep in place the diagonal tension braces *E*, the counter braces *F*, and the eye bars or lower chords *D*, as seen in figures 1 and 6.

The cap plate *m* of the post may be turned up at the edges, so as to keep in place the top chords, or this may be effected by pins in the cap plate entering the holes *x* in the under side of the lower plate c^1 of the upper chords.

It is obvious that the shape of the cross section of the posts may be varied from that shown in figure 9, by adding to or reducing the number of plates *k*, so as to make a circular or polygonal post of any number of sides.

CROSS SECTION



SCALE 1"=1'

Witnesses: Henry Auburn
W. B. Lewis

Inventors:
I. H. Linville by their attys
I. L. Piper D. Bakewell

Sheet 2 2 Sheets

LINVILLE, AND PIPER.

IMPROVED

WROUGHT IRON BRIDGE TRUSS

DETAILS OF POSTS AND CHORDS
SCALE 2"=1'.

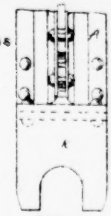


Fig. 8.

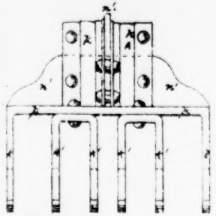


Fig. 7.

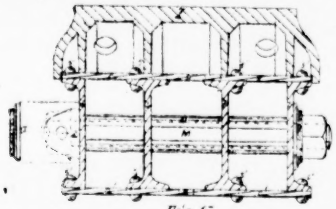


Fig. 5.

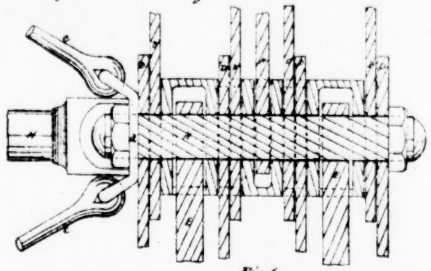
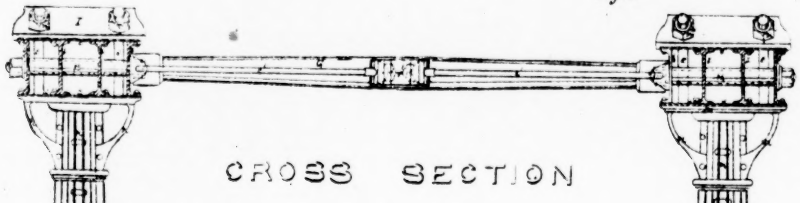


Fig. 6.



CROSS SECTION

The top chords are made by uniting by rivets s^1, any convenient number of I-shaped beams b, of rolled iron, to an upper plate c, and lower plate c^1, both also of rolled iron.

The outside beams may be channel bars instead of I beams, as in figure 5, or either channel bars or I beams may be used if desired. These top chords are made in lengths equal to the distance between the post A, from centre to centre, and are framed together at the shop before being built into the bridge. The semi-circular holes at the abutting ends of these upper chords, formed in the ends of the channel bars and I beams, admit of the passage of the connecting pin M to which the lateral eye plate d, and lateral diagonal braces e^1 are attached (see figure 2.)

The rolled I beams and channel bars afford transverse strength to sustain the floor timbers $f\,f$, (where a deck bridge is to be built), without the use of auxiliary beams, and they also prevent the vertical strain caused by the diagonal tension braces E, from crushing the chords over the posts, and by reason of their peculiar cellular construction, the sectional area of these combined chords can be graduated in each panel of the bridge in proportion to the compressive strain to be resisted. The width of the top and bottom plates combined, as described, affords great lateral stiffness, and the cellular form is most effective in resisting forces of compression.

The lower chords D consist of wide, thin rolled iron bars, with enlarged ends, which are made by upsetting the rolled bars by compressing them into the desired shape in moulds into which the heated iron is forced under immense pressure, thereby increasing the density, toughness, and strength of the enlarged ends, and permitting the holes or eyes for the connecting pins N to be cut out without rendering the transverse section at the eye less than that of other parts of the bar, or diminishing the transverse or longitudinal strength of the chord bar.

We do not claim the upsetting of bars in the manner described, nor any peculiar mode of performing the operation, but merely the use of chord bars for bridges, the ties of which are thus

formed so as to give additional strength to the bar where it is so much needed.

Having thus described our improvements in wrought iron truss bridges, which are applicable also to truss frames for other purposes, what we claim as our invention and desire to secure by Letters Patent is:—

1st. The use of posts for wrought iron truss frames having a curved or polygonal section, composed of two or more plates of rolled or wrought iron with flanged edges secured together by means of rivets passing through such flanges, and through ferrules interposed between them, to give any desired enlargement to the posts and leave space for the passage of the counter braces without cutting away or weakening the post; such posts being completed with by bases and capitals of wrought or cast-iron riveted thereto, substantially as and for the purposes hereinbefore mentioned.

2d. The use of upper chords or compression beams formed by a combination of I-shaped rolled beams, or channel bars, or both, riveted at top and bottom to plates of wrought-iron, so as to form in each chord or beam a series of rectangular tubes or cells, for the purpose of affording great transverse strength to support the weight of passing trains in railroad or other bridges, combined with great resistance to compressive force, substantially as hereinbefore described.

3d. The use for the lower chords of truss frames of wide and thin rolled bars with enlarged ends formed by upsetting the iron when heated by compression into moulds of the required shape for the purpose of increasing the density, toughness, and strength of the eye of the rod, and enlarging the eye, without diminishing its transverse section, substantially as hereinbefore described.

IN TESTIMONY WHEREOF, we, the said Jacob H. Linville, and John L. Piper, have hereunto set our hands in presence of witnesses.

JACOB H. LINVILLE,
JOHN L. PIPER.

A. S. NICHOLSON,
W. D. LEWIS.

In the Circuit Court of the United States, Eastern District of Pennsylvania.

SAMUEL J. REEVES, *vs.* THE KEYSTONE BRIDGE COMPANY, J. H. LINVILLE, AND OTHERS.	In Equity.

OPINION OF COURT.

McKENNAN, *Circuit J.*

The respondents do not deny the making and use of the column described in the complainant's patent. They deny that he was the first and original inventor of the invention claimed by him, and allege that his patent is invalid. This allegation rests upon the following specifications:

1. That the invention was originally made by Jacob H. Linville and John L. Piper.

2. That it was described in the Allegemeine Bauzeitung for September, 1861.

3. That it was illustrated by a drawing in the Dreyfuss Album, bearing the imprint of 1861.

To test the defensive sufficiency of this allegation, the nature and peculiarities of the invention must first be exactly understood.

They are stated in general terms in the patent. The patent is dated June 17, 1862, and is for an improvement in the construction of columns, shafts, braces, &c. The invention is thus described: "I use three or more wrought iron bars, similar to those marked *a. a. a. a.* in the annexed drawing, to which reference is hereby made, of such shapes and dimensions, so that when arranged together, in the direction of their length, and fastened by rivets or bolts *c*, through their flanges *b*, they shall form a hollow shaft or column." And the patentee claims: "The uniting together three or more pieces of wrought iron, made with flanges, in the direction of their length, so that they shall form a column or shaft, to be used as posts, and also as braces or compressive chords, in the construction of buildings, bridges, piers or other structures."

The peculiar features of this column are, that it is composed of not less than three longitudinal segments or bars of wrought iron; that the edges are flanged throughout their whole length; that when they are brought together the flanges are brought face to face; and the unity of the column is secured by bolts or rivets passing through these flanges, at short intervals.

Its distinguishing advantages are, that by using three or more pieces, each can be more easily and cheaply rolled; that by increasing the number of pieces, a post of any

diameter, and any reasonable length, and of varying thickness of metal, can be made in an ordinary rolling mill as readily and cheaply by the pound as posts of small diameter; that they can be handled by workmen and put together with greater facility and with the ordinary mechanical appliances; that the material embodied in it is concentrated in its periphery, thereby increasing its diameter, and consequently its strength; and that the flanges serve as buttresses, practically extending its diameter and giving it additional strength and power of resistance.

A hollow wrought-iron column does not constitute the patentee's invention, but it consists in a hollow shaft, so made as the result of a concentration in its periphery of the metal used in its construction, composed of at least three longitudinal segments of rolled iron, with flanges throughout their whole length, which are to be brought face to face, and through which they are to be fastened by bolts or rivets. This whole organization makes up the distinctiveness of the column, and is necessary to secure the advantages in manufacture and efficiency, which are claimed to belong peculiarly to it.

Under the proofs in this case, and aside from the specific objections hereafter to be noticed, it is hardly disputable that such a post is both novel and useful. Its utility is not contested, but its novelty is denied upon the several grounds before stated, which are now to be considered:

I. The invention is claimed by Linville and Piper, two of the respondents. On the 14th of January, 1862, a patent was granted to J. H. Linville for an improvement in

iron truss bridges, which is described as partly consisting in a "novel construction of the posts of wrought and cast iron." This post is composed of two rolled plates of wrought iron, semi-octagonal in form, secured by rivets passing through the whole length of its diameter, or by bands shrunk around it, binding the plates firmly to distance pieces interposed between them at suitable distances to spring them apart at the middle and terminating in cast iron bases and capitals. In the second claim of his specification, the patentee, therefore, very properly described his post as "composed of two wrought iron plates or bars a, a, distance pieces b, b, and rivets J, J, or their equivalents, and cast iron bases L, L, and capitals O, O, the whole combined as herein specified."

It must be observed that the specification does not indicate the form of the post, as an appropriated or distinctive feature of the invention. The shaft is composed of two rolled iron bars, but that it must be hollow is an inference merely from the description. In comparing the invention with others, it must be considered as the product only of the elements, which the patentee has indicated as necessary to give it its distinctive character. While, therefore, it may be constructed upon the principle of expanding the metal from the centre towards the periphery, yet the special mode in which this principle is embodied in it, and is made practically available, constitutes its patented peculiarity.

Treating it then as the patentee himself does, not as a technical combination, but an organized unit, composed of the enumerated constituents, I think it is essentially

distinguishable from the complainant's post. They are alike only in this, that neither is solid, and both are made of rolled iron plates. In every other material point they are unlike. This dissimilarity consists, first, in the number of pieces of which the column is composed; second, in the use or absence of flanges to these pieces; third, in the mode of uniting or fastening the several pieces of the columns together; and fourth, in keeping the pieces in a straight line, and therefore parallel to each other, or forming them into curves by swelling the post in the middle. That these differences are essential, is apparent from Mr. Linville's specification, in which he described plates without flanges, their number, the mode of fastening them together, and their being sprung apart at the middle, as component and, therefore, material constituents of his organized post.

But it is unnecessary to enlarge upon this. Any other hypothesis is inconsistent with the patentee's acts. His patent imports that he was the sole inventor of the post therein described. But in 1865, in conjunction with Mr. Piper, he applied for and obtained a patent nominally for improvements in his post of 1862, but really changing its fundamental organization and seeking to fix its invention in 1860, and in fact describing and appropriating the distinctive features of Reeves' post, which had been patented three years before. Not only does this show that the post in question was not an improvement of which the post of 1862 was the basis, and that the patent of that year was not regarded as expansive enough to embrace it, but it is, in fact and in law, an impressive disclaimer of his right to make an exclusive appropriation of it.

It is vigorously urged that although the patent of 1865 to Linville and Piper is subsequent in date to Reeves, the post described in it was invented in 1860, and that they, therefore, anticipated him. It is in evidence by several witnesses, that in 1860 Linville and Piper were engaged together in getting up plans for a proposed railroad bridge over the Schuylkill, near the Arsenal, at Philadelphia, that sketches of various forms of posts were made, among them those described in the patents of 1862 and 1865, that all the forms thus delineated were rejected, except the one described in the patent of 1862, which was adopted for the construction of the posts in that bridge, that the sketches of the post described in the patent of 1865 were preserved for a time but were lost, that no post of that description was made by the patentees until after the date of that patent, and in fact that nothing beyond the making of the sketches was done to embody or carry out the alleged invention until the patent was applied for.

Will these sketches carry back the date of the invention to the time when they were made, and thus give the patentees priority over the complainant or invalidate Reeves' patent? There is no doubt that Reeves was an original inventor of the post claimed by him. It was the product of his own reflections and mechanical knowledge. He is presumed to be the first inventor of the thing patented by him, and this presumption is in no wise impaired by the subsequent grant of a patent to another for the same thing. The effect of the sketches referred to, upon his rights, must therefore be determined without reference to the patent of Linville and Piper.

A patentee whose patent is assailed upon the ground of want of novelty, may show, by sketches and drawings, the date of his inceptive invention, and, if he has exercised reasonable diligence in "perfecting and adapting" it and in applying for his patent, its protection will be carried back to such date. And in a race of diligence between rival inventors, the one who first perfects an invention and embodies it in a distinct form is entitled to priority. But can this be accorded to one who has conceived the idea of an invention, and has sketched it on paper, but has done nothing more in reference to it for a period of five years, as against the patent of an independent though subsequent inventor? Reasonable diligence in "perfecting and adapting" the invention is essential to the efficacy of such a claim. This is the express condition prescribed by the 15th section of the Patent Act of 1836, as held by Mr. Justice Story, in Reed *vs.* Cutler, 1 Story R. 590. Independent of this provision, he is entitled to priority of right to a patent, who first reduces his invention to a fixed, positive form, adapted to practical use. Unless, therefore, the speculations of Linville and Piper in 1860 had attained the perfection of a completed and patentable invention, their inaction until 1865 would clearly deprive them of the benefit of the 15th section.

Can an invention be considered as "perfected and adapted," which has reached only the maturity of an illustration on paper? In White *vs.* Allen, 2 Fisher, 446, Judge Clifford says: "Original and first inventors are entitled to the benefit of their inventions if they reduce them to practice, and seasonably comply with the require-

ments of the patent laws in procuring letters-patent for the protection of their exclusive rights. While the suggested improvement, however, rests merely in the mind of the originator of the idea, the invention is not completed within the meaning of the patent laws; nor are crude and imperfect experiments sufficient to confer a right to a patent; but in order to constitute an invention in the sense in which that word is employed in the Patent Act, the party alleged to have produced it must have proceeded so far as to have reduced his idea to practice, and embodied it in some distinct form. Gayler *vs.* Wilder, 10 How. 498; Parkhurst *vs.* Kinsman, 1 Blatch. 494; Curtis on Pat. sec. 43. Mere discovery of an improvement does not constitute it the subject matter of a patent, although the idea which it involves may be new; but the new set of ideas in order to become patentable must be embodied into working machinery, and adapted to practical use. Sickles *vs.* Borden, 3 Blatch. 535." And in Ellithorpe *vs.* Robertson, Law's Dig. 428, sec. 48, Judge Ingersoll said: "The making of drawings of conceived ideas is not such an embodiment of such conceived ideas into practical and useful form, as will defeat a patent which has been granted." Equally strong is the language of Mr. Justice Nelson in Winans *vs.* Harlem R. R. Co., Franklin Journal, 3 ser. vol. 61, 322, where he says: "The circumstances that a person has had an idea of an improvement in his head or has sketched it on paper, has drawn it, and then gives it up, neglects it, does not, in judgment of law, constitute or have the effect to constitute him a first and original inventor." Numerous other cases affirm the same

doctrine; and it must, therefore, be considered as an established rule that illustrative drawings of conceived ideas do not constitute an invention, and that unless they are followed up by a seasonable observance of the requirements of the patent laws, they can have no effect upon a subsequently granted patent to another. Applying this rule to the present case, the conclusion is unavoidable that Linville and Piper had not "perfected and adapted" an invention in 1860, and that by reason of their subsequent and long-continued remissness, they lost any inchoate right they might have had to priority over Reeves.

But we are not left to speculation to determine the actual character of what was done by Linville and Piper in 1860. They were induced to make sketches of different forms of wrought iron posts by the proposed erection of the Arsenal Railroad Bridge, and their object was to devise and present the form of post best adapted to that structure. What was done very satisfactorily appears in the testimony of Edward Crueger, a witness for the respondents, who was Mr. Linville's draughtsman at the time. He says: "Mr. Linville showed and sketched for me different forms of wrought iron bars or pieces for posts; any number of them and all shapes, of angle iron, of T iron, of round iron, of oval iron. I can't remember the number of shapes he gave me; they were too many. He had two pieces in some posts and four in others. Finally he (Linville) rejected all the other pieces except these pieces, which we employed at the Schuylkill bridge." And the testimony of Linville and Piper is in substantial accord with this. Can there be any doubt, in

view of this testimony, that the efforts thus described were experimental merely as to all the forms of post except the one which was adopted? The proofs show further that the sketch of the post, then rejected, but now in controversy, was lost, with other sketches, in 1863, and that it was not reproduced until 1865, when steps were taken to obtain a patent. In the mean time Reeves had invented, "perfected and adapted," and obtained a patent for his post, and was engaged in its manufacture and introduction into public use. In point of fact, then, all that Linville and Piper did before the date of Reeves' patent can only be regarded in the light of experiment, which they abandoned, and did not take up again until the lapse of more than two years after his patent was issued.

Whether the sketches made are to be considered as an incomplete invention, not prosecuted with the required diligence, or as an experiment actually abandoned, they cannot impair the right of Reeves to be treated as the first inventor.

II. The publication of the description and plates in the *Allgemeine Bauzeitung* preceded Reeves' invention. It is a public work, and describes the post illustrated by the accompanying drawing "in such full, clear, and exact terms that any one skilled in the art to which it appertains could construct it." If Reeves' post would be the product of this description, his patent cannot be sustained.

The post described in this work is cruciform. It consists of a flat iron bar, which forms the main part of the column, with two other flat bars at right angles to it, connected by means of peculiarly shaped angle irons, so that

in the centre of the connection a hollow space is formed, which produces an increase of the rigidity of the column, while the section remains which is necessary for carrying the load. Now it is apparent that the single flat bar is prescribed as the main part of the column, relied upon to bear up the weight imposed upon it, that the two other bars are designed to furnish it lateral support, and that the angle irons, while they serve the purpose of connection, are further auxiliary to it by giving it additional stiffness. This I think is the fair interpretation of both Mr. Bonzano's and Mr. Both's translations. Following the description, then, all these bars, or at least the single one, must necessarily be incorporated in the structure. To omit them would be to discard the part prescribed as necessary to resist the compressive strain upon the column, and, therefore, to abandon the vital principle of its construction. Indeed all these constituents must be embodied in it to fulfill the fundamental requirements of the text.

Now a column thus constituted is not the column of Reeves. It differs from it in the necessary elements which compose it, and in the principle of its construction and operation. Four angle bars and at least one flat cross bar must be incorporated in its structure, while in the Reeves column, three flanged bars, without any cross bar, are required, and as many more as are desired may be employed. The latter is entirely hollow and must be made so to conform to the fundamental conditions of its construction. It corporealizes the principle that increase of diameter secures additional power of compressive resistance, and, therefore, that the metal used in its construc-

tion must be thrown out as much as possible from its centre and concentrated in its periphery. Its resisting power is located exclusively in its circumference. Such a condition is certainly not indicated in the German description of that post. As before stated, the bar which traverses its diameter is an indispensable part, and as it is described as subject to the greatest compressive strain, corresponding strength for resistance must be provided in the diameter of the post. This is a vital diversity, so that the two posts can only be identified by confounding the distinct principles embodied in each of them.

In Reeves' specification it is said, "the stiffness and strength of columns made in this manner may be increased at a very moderate expense, by setting plain bars of iron between the flanges of the bars a a a a, and riveted to them, and extending outward from the centre; thus, in effect, increasing the diameter of the column." Hence it is argued that a post, thus constructed is identical with the post described in the German work. To reach this conclusion the clause quoted must be construed as directing the extension of the bars set between the flanges outwardly from the centre as the beginning, and not outwardly from the flanges.

The advantages contemplated are increased stiffness and strength of the column, and it is proposed to secure them by an increase of its diameter only in the effect due to an extension of the interposed bars. An increase of actual diameter by an enlargement of the circumference to the extent of the thickness of the bars, was not designed, because that would be due only to the interposition of the

bars between the flanges, not, in any sense, to their extension in either direction beyond them. An inward extension of the bars might impart increased strength to the column, but it certainly would not lengthen its diameter. As interior braces, the extensions would doubtless give additional stiffness to the column, but that would involve a distribution of material, in conflict with the general design of the patentee and the tenor of his specification, and would secure it by an agency different from the one expressly prescribed by him. An operative increase of the diameter, produced not by an expansion of the periphery, but by an extension of the interposed bars, is what the specification contemplates. A cheap method of practically increasing the diameter without a corresponding enlargement of the whole circumference is the suggestion. How is this to be attained? Solely by an exterior extension of the bars set between the flanges. When it is considered then that the effect of the extension only in increasing the diameter was contemplated, and that this will not be produced by extending the bars wholly within the column, the specification must necessarily be taken to fix the flanges as the starting point, whence the bars are to extend outwardly, or away from the centre.

III. The only remaining reference is the "Dreyfuss Album." It is a book of printed drawings, representing different forms of iron fabrics made by a Paris manufacturer, and bears the imprint of 1861. Under the head of "corners" is a drawing representing a transverse section of an iron column, corresponding with one of the figures referred to in the specification of Reeves. When this book

was printed does not appear, otherwise than presumptively from the imprint on its title page. When it was published or put in circulation does not appear at all, except that possession of it was obtained by the respondents after the institution of this suit.

The 15th section of the patent act of 1836—and it has been incorporated in the act of 1870—provides that a patent may be successfully opposed by showing that the thing patented "had been described in some public work anterior to the supposed discovery thereof by the patentee." It is obvious that this provision requires—1st, a description of the alleged invention; 2d, that it shall be contained in a work of a public character and intended for the public; and, 3d, that this work was made accessible to the public by publication before the discovery of the invention by the patentee.

Whether the work in evidence is a public or only a private work, intended merely for private circulation, is fairly a disputable question. It contains an illustration by a drawing of the thing intended to be represented, without verbal description; and whether this is a description at all, or such an one as the Act contemplates, may well be denied on the authority of Seymour *vs.* Osborne, 11 Wall. 516, and the cases there referred to with approval. But it is unnecessary to decide these questions, as the proof is deficient in another essential particular. It is not shown that the work was published before the date of the complainant's patent. This must be directly proved. It is not deducible from the imprint on the title-page. That the work was then printed may be inferred from this

imprint; but when it was put in circulation or offered to the public is a distinct fact, which must be proved independently. The intended circulation of a book of a public nature may be presumed from its being put into print; but it does not follow that a work, such as the one in question, was made accessible to the public as soon as it was printed, or that it was actually published at all. As it does not appear that this book was published before the patentee's invention, as evidence it is altogether inconsequential.

The complainant is entitled to an allowance of the prayers of his bill, and a decree will, therefore, be entered for a perpetual injunction and an account, with costs.

In the Circuit Court, Eastern District of Pennsylvania.

THE KEYSTONE BRIDGE CO.
vs.
THE PHŒNIX IRON CO.
} In Equity.

MCKENNAN, *Circuit J.*

The opinion just read in the case of Reeves *vs.* The Keystone Bridge Co., renders it unnecessary to consider the alleged infringement of the second claim of Linville's patent of 1862, and the first claim of the patent of Linville and Piper of 1865. The only claims of these patents which it is necessarry to notice relate to the lower chord bars of truss bridge structures. It is in the use of these bars that the infringement is alleged to consist.

The first claim of the patent of 1862 is for the construction of the lower chords of truss bridges of series of eye bars wide and thin, drilled eye bars, applied on edge between ribs on the bottom of the posts, &c. The form of the bars is of the essence of the claim—*wide* and *thin* bars only are claimed —and, as the only proof of infringement is, that the respondents made eye bars *round* in section, which were used in the Lasalle bridge, to perform the functions of tension

chords, the patent of 1862 may be dismissed from further consideration.

The third claim in the patent of 1865 is for "the use, for the lower chords of truss frames, of wide and thin rolled bars, with enlarged ends formed by upsetting the iron when heated by compression into moulds of the required shape. As the respondents are proved to have made only *round* chord bars, which were used in the Lasalle structure, it may well be doubted that they have infringed this claim; and especially as they are not employed or adapted to give vertical support to the roadway, which is an important function of the complainant's lower chords, and is the reason of their peculiar conformation. But waiving this, and assuming that the enlarged ends of the respondent's chord bars are formed as described in the claim, it is not to be doubted that the patent is limited to the *use* of the chords in bridge structures. This is distinctly set forth in the specification, where it is stated that "we do not claim the upsetting of bars in the manner described, nor any peculiar mode of performing the operation, but merely the *use* of chord bars for bridges, the ties of which are thus formed, so as to give additional strength to the bar where it is so much needed." The exclusive right to make chord bars in any mode is distinctly disclaimed; only their use, when formed as described, is appropriated by the patentees and forbidden to others. They in effect declare that any one may lawfully make the bars, and that no encroachment upon their rights is committed until the bars are used by being put into a bridge.

Now the respondents are iron manufacturers, and it is

shown that the bridge at Lasalle, Illinois, was built by Kellogg & Clark, who obtained the iron for it from the respondents, and that the bottom chords used in it were like those claimed by the complainants. This is all the proof of infringement, and I think it falls far short of fixing any accountability upon the respondents. They made the bars, but did not use them—Kellogg & Clark did that. They did only what they had a legal right to do, and did not thereby assume any responsibility for the wrongful acts, or become involved in the unlawful purposes of others. Nor can this responsibility be imposed upon them, because privity with a wrong doer is not necessarily to be inferred from the exercise of a legal right.

My attention has been called to the opinion of Judge Woodruff in the case of Wallace & Sons *vs.* Holmes and others, reported in the Official Gazette of the Pat. Off. vol. 1, No. 6. The case is a peculiar one. It involved the infringement of a patent for an improved lamp-burner in combination with a chimney, where the respondents made and sold the burner alone, leaving the purchaser to supply the chimney, without which such burner is useless. And it was held that all who were engaged in the manufacture of the different parts of the combination, and using it thereafter, were infringers, for the reason that "all are *tort feasoor* engaged in a common purpose to infringe the patent, and actually, by their concerted action, producing that result." Now, can it be doubted that, if the respondents there had been licensed by the patentee to make and sell his improved burner, and this was all they did, the

result would have been different? And yet this is substantially the attitude of the respondents here. By clear implication, the patentees have authorized the respondents to make and sell the chord bars described in their patent, and have declared that only those who use them as lower chords in bridge construction can be called to account for infringement. Having, therefore, exercised the conceded rights of manufacturers only, the respondents cannot, by any strained inferences, be implicated in the wrongful acts of others.

The bill must, therefore, be dismissed with costs.

IN THE

Supreme Court of the United States.

KEYSTONE BRIDGE COMPANY, APPELLANT,

vs.

PHŒNIX IRON COMPANY, APPELLEE.

APPELLEE'S SUPPLEMENTAL ARGUMENT.

There are three charges of infringement in appellant's bill, which are extracted on pages 2 and 3 of appellant's brief.

The first of these relates only to the *second* claim of the appellant's patent of 1862, the infringement of which claim is abandoned by the appellant in this court.

The second charge of infringement in appellant's brief, relates to the use of *upper* chords in a peculiar way, as recited in the second claim of appellant's patent of 1865, which infringement is not pressed by appellant in this case.

The only charge of infringement in complainants' bill, which relates to the infringement now pressed, to wit, of claim 1 of appellants' Patent of 1862, and claim 3 of appellant's Patent of 1865, is in the following language: "That the said defendants are infringing upon the rights of complainants." * * * * "Also by the *construction of the lower chords* of truss-frames *for* bridges *out of wide*

and thin rolled bars of wrought iron, the eye end of which is enlarged, and is formed by upsetting the iron when intensely heated, by compression, into moulds of the required shape, for the purpose of increasing the density, toughness, and strength of the eye of the rod, and of enlarging the eye without diminishing the transverse section, substantially such as described in the first claim of the said Letters Patent No. 34,183, bearing date January 14, A. D. 1862."

The appellant's Patent of 1862, states, (Record p. .)

"My invention consists, 1st, in a *novel construction of the lower chords*, and mode of applying the same in combination with the posts and other parts of the truss."

* * *

"The bottom chords, C C, are each composed of a series of *wide thin eye bars* of wrought iron, of a *length* corresponding *with the distances between the posts* on one side of the truss, *placed on edge to enable them to give vertical support to the roadway*, and fitted outside of the bases L L, of the posts, and between ribs S S, formed on said bases, as shown in figures 2 and 4.

"The bars are extended in width at their ends, and drilled to receive connecting pins P P, one at the base of each post, the said pins passing through the said ribs S S, and being supported by the suspension bars D D which, as well as the counter diagonals, E E, are also fitted between other and similar ribs, S S, the lower end of the said bars being made with eyes for the reception of the said pins. The said chords, the ribs S S, and the diagonal rods, D D, and E, *are so disposed or distributed as to obviate all danger of bending the connecting pins, P P, which can only yield by being sheared off by the tensile strain on the chords and diagonals; and the chords being thus well-supported at short intervals, support the floor beams and track, without the employment of auxiliary beams for this purpose.*"

The first claim, of the Patent of 1862, is as follows:

"The construction of the lower chords of truss bridges, of series of eye bars, *wide and thin*, drilled eye bars, C C, applied on edge between ribs S S, on the bottoms of the posts, and connected by pins P P, supported in the diagonal tension braces D D and E, all substantially as herein described."

AS TO APPELLANT'S PATENT OF 1865.

The appellant's patent of 1865 states nature of improvement, over the patent of 1862, to consist in—

"3d. The use of bottom chords of *thin wrought-iron plates*, the eye of which, at each end, instead of being *cut out* of a rolled plate and drilled or forged into shape, is upset under strong compression, so as to give at the eye of the bar a degree of strength equal or superior to that of the bar at any point between the eyes."

* * * * * * *

"The lower chords *D* consist of *wide, thin rolled iron bars*, with enlarged ends, which are made *by upsetting the rolled bars by compressing them into the desired shape in moulds* into which the heated iron is forced *under immense pressure*, thereby increasing the density, toughness, and strength of the enlarged ends, and permitting the holes or eyes for the connecting pins N to be cut out without rendering the transverse section at the eye less than that of other parts of the bar, or diminishing the transverse or longitudinal strength of the chord bar."

DISCLAIMER.

"We do *not claim the upsetting of bars in the manner described, nor any peculiar mode of performing the operation*, but merely the *use* of chord bars *for bridges*, the ties of which are thus formed so as to give additional strength to the bar where it is so much needed."

CLAIM 3.

"3d. The use for the lower chords of truss frames of *wide and thin rolled bars* with enlarged ends formed by *upsetting* the iron when heated by compression *into moulds* of the required shape for the purpose of increasing the density, toughness, and strength of the eye of the rod, and enlarging the eye, without diminishing its transverse section, substantially as hereinbefore described."

TESTIMONY AS TO INFRINGEMENT.

The testimony as to infringement is comprised in the following:

Linville, appellant's only witness, does not pretend that he

saw a single tie-bar *in* the Lassale bridge, or that the appellees had anything to do with the building of the bridge.

Linville, record, page 58:

"Q. 33. How do *you know* that the Phœnix Iron Company made these bases and chords, and how do you know that the chords were made by the upsetting process?

A. The bridge *was being built, to my knowledge, by Charles Kellogg*, of the firm of Kellogg & Clark, bridge-builders; and I have knowledge, from Mr. Reeves' conversations and admissions in my office, that the iron work of them was made by the Phœnix Iron Company. I think also that some of the pieces that I saw had the mark of the Phœnix Iron Company on them. The opinion expressed as to the manner in which the lower chords were made—that is, by upsetting—was derived from the inspection of the ends and from my knowledged of the appearance and marks of the mould on chords so made.

Linville does not say that the bars made by appellees were "*wide and thin*," or that their ends are "upset in a mould into the required shape." (Linville, record, p. 59.)

His testimony is as follows, (Record, p. 59:)

"Q. 24. Have you read, and do you understand, the description of the process of upsetting chords, as practiced by defendants, as testified to by Samuel J. Reeves, (answer to question 36 of his testimony;) and if so, state wherein, if at all, such process differs from that described in your patent of 1865?

"A. I have read the testimony of Mr. Reeves referred to, and think there is no substantial difference between the defendants' process therein described and as described in our patent of 1865. In our patent we describe the enlarging or upsetting the ends of the chords by compressing them into the desired shape in moulds, into which the heated iron is forced under immense pressure. According to the testimony of Mr. Reeves, the process of the defendants contemplates the heating of the end to be upset or enlarged, and placing this end in a die or mould which is larger than the desired thickness of the chord; pressure is then applied to the chord until its end is made to fill the die or mould; it is then removed, reheated, and placed in another mould or die, which is of the width required for the end when finished; pressure is then applied to this die, and by means of this pressure the heated end is spread or enlarged so as to fill the die or mould. The object sought to be obtained in both is the enlargement of the end so as to permit the holes

or eyes for the pins to be made without reducing the transverse sections of the ends of the chord to a less area than that of the body of the chord, and of so accomplishing this by means of pressure as to increase the density and toughness of the metal. Mr. Reeves has not described the means of applying the pressure in the machine used by them, nor the manner by which the box of the machine holding the dies is bound together; but while in such respects there may be a difference between the methods of applying the pressure as practiced by them from the mode as practiced by us, yet in both cases the chords are formed under pressure, and so the chords and the method of upsetting them are, in my opinion, substantially the same."

"×-Q. 94. Was not the whole body of those eye-bars, except the eye, round?

A. It was.

×-Q. 95. Do you call a round bar, with a flattened end enlarged for an eye, a wide and thin eye-bar?

A. I would call the eye wide and thin; before the eye was formed I would call the bar a round bar.

×-Q. 96. After the eye is formed is such a bar properly described as a wide and thin eye-bar?

A. I think it would be if it had a wide eye in comparison with its thickness."

At page 12 of record the size of the appellant's eye-bar, as actually used, is given as about 9 inches deep by one inch thick, and twelve feet long.

The round eye-bar of appellee, to have same cross-section, would be about $3\frac{3}{4}$ inches in diameter, and its capacity to resist deflection would be one ninth only of the wide and thin bar, while its tensile strength would be greater.

Linville describes the process of upsetting practised by appellants at page 59 of record which will be found wholly different from appellee's mode.

"Q. 25. Look at the machine, Exhibit E, (testimony of Jacob Szink,) and state what it represents, and when and by whom it was invented.

"A. That machine is the model of a machine invented by J. L. Piper and myself, as constructed at Altoona, under our direction, early in 1862, for the purpose of performing the process of upsetting. The original machine was constructed at the expense of the Pennsylvania Railroad Company, and was and is their property.

"Q. 26. Describe the operation of the machine represented by Exhibit E.

"A. This consists of a mould or die having a lid which is hinged so as to be capable of being lifted, permitting the insertion of the heated chord, and its removal when upset or enlarged. The machine also embraces a "follower," to the end of which pressure is applied so as to cause the heated chord to spread or fill the mould or die—the lid of the mould being keyed down during the application of the pressure."

Linville, record, p. 69:

"×-Q. 101. This process is performed by machinery of a peculiar kind, is it not?

"A. The moulds in which the chords are formed, and the follower through which the pressure is applied to the end of the chord, is peculiar to all the machines that I have knowledge of. These are essential portions of the machines; the method of confining the mould, and of producing the requisite power to compress the heated iron, varies in all the machines that have been constructed since the invention of our Altoona machine, and may be varied at the will of the manufacturer.

"×-Q. 102. Is there anything in your patent which will enable a mechanic to form or make the eye-bars as described by you?

"A. I believe there is in the references already given. We describe these bars as made by 'upsetting the bars by compressing into moulds into which heated iron is forced under immense pressure.' This indicates the shape of the bar—the moulding of it—the means by which the moulding was produced, and indicates, in my opinion, the essential portions of the machine, and the process of moulding bars under pressure."

The machine used was one in which a *flat, thin bar* was treated by immense end pressure, and by a single operation upset into the required shape in a mould.

Mr. Reeves, when making the Steubenville wide thin bars for Linville, thus speaks of the exigency of such a machine, (Record, p. 14:) "Our experimental trial, made early in the season, proved exactly what I had predicted before the trial, which was, that our power was too light and slow. To make links successfully, it is necessary to have *unlimited power* operating upon the bar *rapidly*, so that it may be formed in less than a minute after its removal from the furnace."

Mr. Reeves proves that, after trial, this mode of upsetting was found impracticable, and he adopted his present mode, as pursued in making the tie-bars in question, (Rec., p. 82:)

"Q. 36. What has been your experience in manufacturing these eye-bars upon the machine described in the patent issued to Mr. Sellers, and what has been found necessary to form a complete flat eye-bar, when that machine is used?

"A. The machine was found to be insufficient to fill the mould or die at one operation. The difficulty which first manifested itself was the tendency of the iron to thicken at the nearest point of pressure. The force exerted by the plunger upon the end of the heated bar did not act at the end nearest the shank of the bar with sufficient force to compel it to occupy the vacant space in the die. The tendency of the force was to expend itself in pushing out the iron which was nearest to it, because the yield must be in the direction of the least line of resistance. That least line is the thickness of the bar. The greatest line of resistance is that which coincides with the length of the bar itself. We therefore abandoned that mode of making eye-bars, and now practice a different one, which is as follows: We first heat the end to be upset, and put it into a die larger than the end of the bar, and permit the bar to thicken up as much as possible. We then take the bar to another furnace and reheat the end, and put it under a press in which there is a die of the form of the eye to be made, and flatten the end until it fills the die."

LINVILLE & PIPER'S

IMPROVEMENT

IN

WROUGHT-IRON BRIDGES.

Patent dated October 31st, 1865.

THE UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, greeting:

THIS IS TO CERTIFY, That the annexed is a true copy, from the records of this office, of the letters patent granted Linville & Piper October 31st, 1865, No. 50,723.

In Testimony Whereof, I, A. M. Stout, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this twenty-first day of March, in the year of our Lord one thousand eight hundred and sixty-seven, and of the Independence of the United States the ninety-first.

A. M. STOUT,

[L. S.] *Acting Commissioner.*

No. 50,723.

THE UNITED STATES OF AMERICA

To all to whom these Letters Patent shall come:

WHEREAS, Jacob H. Linville, of Pittsburg, and John L. Piper, of Altoona, Pennsylvania, have alleged that they have invented a new and useful improvement in wrought-iron bridges, which they state has not been known or used before their application; have made oath that they are citizens of the United States; that they do verily believe that they are the original and first inventors or discoverers of the said improvement, and that the same hath not, to the best of their knowledge and belief, been previously known or used; have paid into the TREASURY OF THE UNITED STATES the sum of thirty-five dollars, and presented a petition to the COMMISSIONER OF PATENTS, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose.

THESE ARE THEREFORE to grant, according to law, to the said Linville & Piper, their heirs, administrators or assigns, for the term of seventeen years from the thirty-first day of October, one thousand eight hundred and sixty-five, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement, a description whereof is given in the words of the said Linville & Piper in the schedule hereunto annexed, and is made a part of these presents.

[L. S.] *In Testimony Whereof*, I have caused these letters to be made patent, and the seal of the PATENT OFFICE has been hereunto affixed. GIVEN under my hand, at the CITY OF WASHINGTON, this thirty-first day of October, in the year of our Lord one thousand eight hundred and sixty-five, and of the Independence of the United States of America the ninetieth.

Countersigned and sealed with the seal of the Patent Office.

W. T. OTTO,

Acting Secretary of the Interior.

T. C. THEAKER,

Commissioner of Patents.

THE SCHEDULE REFERRED TO IN THESE LETTERS PATENT, AND MAKING PART OF THE SAME.

1865

To all whom it may concern:

BE IT KNOWN, That we, Jacob H. Linville, of Pittsburg, in the county of Allegheny and State of Pennsylvania, and John L. Piper, of Altoona, in the county of Blair and State of Pennsylvania, have invented a new and useful improvement in wrought-iron bridges, or other truss-frames; and we do hereby declare the following to be a full, clear and exact description thereof, reference being had to the accompanying drawing forming part of this specification, in which

Figure 1 is a side elevation of two panels of a wrought-iron truss bridge, with double intersecting diagonal tension-bars.

Figure 2 is a transverse section of the same.

Figure 3 is a side elevation of the wrought-iron upper chord.

Figure 4 is a top-view of the same.

Figure 5 is a transverse section of the upper chord through the centre of the angle-block in the plane of the centre of the posts.

Figure 6 is a horizontal section through the base of the post and lower chord-bars.

Figure 7 is an end-view of the wrought-iron base of the post.

Figure 8 is a side-view of the base of the post.

Figure 9 is a cross-section through the centre of a post.

The same letters are used in the several figures to indicate similar parts of the bridge.

Our invention consists of certain improvements in the construction of the wrought-iron truss bridge, for which letters

patent of the United States were granted to us on the 14th January, 1862. In the truss bridge shown in the accompanying drawings the general arrangement of the parts is similar to that shown in our previous patent just referred to—the improvements forming the subject-matter of this invention relating to the following particulars:—

1st. The posts, instead of being made of two rolled plates of iron of semi-polygonal transverse section, united by rivets passed through the centre of the polygon and sprung apart by distance-plates, are made of two or more plates of wrought iron, with flanges at the edge—the plates being so united as to make hollow posts, by rivets passed through the flanges, and each plate being arched longitudinally, by means of ferrules placed at intervals between the flanges and around the rivets; and instead of casting the bases and capitals on to the ends of the posts, we use bases and capitals connected by rivets to the post.

2d. Instead of making the upper chords of hollow cast-iron sections or short tubes, we construct an upper chord of a combination of wrought-iron I-shaped beams or channel-bars, or both, connected by wrought-iron plates, so as to form cellular chords of great strength, and capacity of resisting either transverse strain or longitudinal compression.

3. The use of bottom chords of thin wrought-iron plates, the eye of which at each end, instead of being cut out of a rolled plate and drilled or forged into shape, is upset under strong compression, so as to give at the eye of the bar a degree of strength equal or superior to that of the bar at any point between the eyes.

To enable others skilled in the art to construct and use our improvements, we will proceed to describe them more particularly.

In our bridge, the upright posts *A A* are placed at regular intervals in each span, and opposite to each other, on each side, so that the transverse struts *G* may be placed across and at right angles to the roadway, between the upper chords, immediately above the capitals of the opposite posts, and transverse struts *H* similarly placed between the bases of the opposite posts; the ends of the struts *G* and *H* being attached to the connecting-pins *M* and *N* which pass through the upper chords, immediately above the capitals and through the bases of the posts, respectively, as shown in figure 2. To a plate *d* on the inner end of the connecting-pin *M* is attached the end of a diagonal brace e^1,

of which there are four in each panel of the bridge, on a level with the upper chords, meeting in a ring r^1 in the centre, to which they are screwed; and four similar braces *e* are attached to the connecting-pins *N* at the bottom of the posts *A* in each panel, and meet in a ring *r* in the centre, to which they are screwed in the same manner. The bases of the posts *A* are connected at their bases longitudinally by the lower chords *D*, of which four may be placed parallel to each other, on each side of each panel. They are made of thin bars of rolled iron, of sufficient depth, and placed on edge so as to support the roadway, and are attached to the bases of the posts by the connecting-pins *N*, which pass through the hole or eye near the end of these bars. The top chords *B*, composed of wrought-iron beams and plates, riveted together as hereinafter described, are made in sections or lengths reaching from centre to centre of the posts *A*, lengthwise of the bridge, and are placed on the capitals of the posts, and are held in position by projections or pins on the capital of the post, which enter holes *c* in the lower surface or plate c^1 of the chords. On top of the upper chords *B*, and just over each post *A*, and covering the joint or meeting-point of the ends of the chords, is an angle-block *I*, which may be made hollow and of cast iron (as seen in section in figure 5). These angle-blocks form the upper bearing of the nuts n^2 at the ends of the tension-braces *E*, and the counter tension-braces *F*, which support the bridge. Each tension-brace *E* starts from the angle-block *I* at top of one post, passes through the upper chord, and downwards diagonally, passing outside of the next post, crossing it at midway from its top and bottom, and thence extends to the bottom of the third post, where a loop or eye at the end of the brace *E* receives the connecting-pin *N*; two such braces *E* being used side by side, one passing on each side of the posts *A*. The counter tension-braces *F* (which run diagonally in the opposite direction to the braces *E*) start from the angle-block *I* at top of each post *A*, pass through the upper chord *B*, and thence through the centre of the next or second post, and thence to the bottom of the third post, where the connecting-pin *N* passes through the eye or loop at the lower extremity of the counter-brace *F*.

The roadway is composed of sills *f* placed transversely on top of the lower chord-bars *D*, and the string-pieces *g* which sustain the rails *i* are placed longitudinally on the sills, as shown in figure 1; or, if a deck bridge is required, the sills *f* are placed on the top of the upper chords *B*, as shown by dotted lines in figure 1.

Having thus described the general construction and arrangement of our bridge, we will proceed to explain more minutely the peculiar features of the posts, upper chords and lower chords.

The posts consist of three principal parts,—the shaft, the base and the capital. The shaft is made of pieces of rolled iron *k* of sufficient length to extend from the top of the capital to the base. In the drawing, these posts are represented as made of four such pieces of iron, but the number is not material, as two would suffice if they are bent or curved so as to form a hollow post. The edges of these pieces *k* are turned outward so as to form a flange on each edge.

Instead of uniting these pieces or plates *k* by bringing the flanges together, they are separated by ferrules *l* or small tubes of sufficient diameter to receive the rivets *s*. These ferrules are placed between the opposite flanges of the plates *k*, and then a rivet *s*, passed through the flanges and ferrule, and fastened in the usual manner by upsetting, unites them firmly.

The length of the ferrules *l* determines the distance between the opposite faces of the flanges—this distance being greatest at the centre of the post, and gradually diminishing towards each end, thus making the post *A* thickest in the middle. The capital and base may be made of wrought or cast iron; but we prefer the former as less liable to fracture. The capital consists of a cap-plate *m*, placed on top and riveted to the post, and supported by brackets *n* of wrought iron placed between the flanges of the plates *k* composing the posts, in place of the ferrules, and also riveted to the flanges of the plate *k*.

The bases are made in the same manner; a base-plate *p* (see figure 7) being united to the plates *k* of the post by brackets n^1 passing between the flanges of the plates and riveted thereto.

The ends of the base-plate *p* (which may also be made of wrought iron) are turned down, forming ribs *t*, (see figure 7,) and intermediate or mid-ribs t^1 t^1 are added between the ribs *t t* by riveting to the under side of the base-plate. These ribs *t* and mid ribs t^1 have semi-circular notches cut in them (as seen in figure 8) so as to straddle the connecting-pin *N*, and they serve to separate and keep in place the diagonal tension-braces *E*, the counter-braces *F*, and the eye-bars or lower chords *D*, as seen in figures 1 and 6.

The cap-plate *m* of the post may be turned up at the edges so as to keep in place the top chords, or this may be effected by pins in the cap-plate entering the holes *x* in the under side of the lower plate c^1 of the upper chords.

It is obvious, that the shape of the cross-section of the posts may be varied from that shown in figure 9, by adding to or reducing the number of plates *k*, so as to make a circular or polygonal post of any number of sides.

The top chords are made by uniting by rivets s^1 any convenient number of I-shaped beams *b*, of rolled iron, to an upper plate *c* and lower plate c^1, both also of rolled iron.

The outside beams may be channel-bars instead of I beams, as in figure 5, or either channel-bars or I beams may be used if desired. These top chords are made in lengths equal to the distance between the post *A*, from centre to centre, and are framed together at the shop before being built into the bridge. The semi-circular holes at the abutting ends of these upper chords, formed in the ends of the channel-bars and I beams, admit of the passage of the connecting-pin *M*, to which the lateral eye-plate *d* and lateral diagonal braces e^1 are attached (see figure 2).

The rolled I beams and channel-bars afford transverse strength to sustain the floor timbers *f f*, (when a deck bridge is to be built,) without the use of auxiliary beams, and they also prevent the vertical strain caused by the diagonal tension-braces *E* from crushing the chords over the posts, and, by reason of their peculiar cellular construction, the sectional area of these combined chords can be graduated in each panel of the bridge in proportion to the compressive strain to be resisted. The width of the top and bottom plates, combined as described, affords great lateral stiffness, and the cellular form is most effective in resisting forces of compression.

The lower chords *D* consist of wide, thin-rolled iron bars, with enlarged ends, which are made by upsetting the rolled bars by compressing them into the desired shape in moulds into which the heated iron is forced under immense pressure, thereby increasing the density, toughness and strength of the enlarged ends, and permitting the holes or eyes for connecting-pins N to be cut out without rendering the transverse section at the eye less than that of other parts of the bar, or diminishing the transverse or longitudinal strength of the chord bar.

We do not claim the upsetting of iron bars in the manner described, nor any peculiar mode of performing the operation, but merely the use of chord-bars for bridges, the eyes of which are thus formed so as to give additional strength to the bar where it is so much needed.

Having thus described our improvements in wrought-iron truss bridges, which are applicable also to truss-frames for other purposes, what we claim as our invention, and desire to secure by letters patent, is—

1st. The use of posts for wrought-iron truss-frames having a curved or polygonal section, composed of two or more plates of rolled or wrought iron, with flanged edges, secured together by means of rivets passing through such flanges, and through ferrules interposed between them, to give any desired enlargement to the posts and leave space for the passage of the counter-braces, without cutting away or weakening the post; such posts being completed with bases and capitals of wrought or cast iron riveted thereto, substantially as and for the purposes hereinbefore described.

2d. The use of upper chords or compression-beams formed by a combination of I-shaped rolled beams, or channel-bars, or both, riveted at the top and bottom to plates of wrought iron, so as to form in each chord or beam a series of rectangular tubes or cells, for the purpose of affording great transverse strength to support the weight of passing trains in railroad or bther bridges, combined with great resistance to compressive force, substantially as hereinbefore described.

3d. The use for the lower chords of truss-frames of wide and thin-rolled bars, with enlarged ends, formed by upsetting he iron, when heated, by compression into moulds of the required hape, for the purpose of increasing the density, toughness and trength of the eye of the rod, and enlarging the eye, without iminishing its transverse section, substantially as hereinbefore escribed.

In Testimony Whereof, We, the said Jacob H. Linville and ohn L. Piper, have hereunto set our hands, in presence of itnesses.

JACOB H. LINVILLE,
JOHN L. PIPER.

a. S. NICHOLSON,
. D. LEWIS.

1865

J. H. LINVILLE'S

(ASSIGNED TO LINVILLE & PIPER)

Improvement

IN

IRON TRUSS BRIDGES.

Patent dated January 14th, 1862.

J. H. LINVILLE'S

(ASSIGNED TO LINVILLE & PIPER)

Improvement

IN

IRON TRUSS BRIDGES.

Patent dated January 14th, 1862.

THE UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, greeting:

THIS IS TO CERTIFY, That the annexed is a true copy, from the records of this office, of the letters patent granted Linville & Piper January 14th, 1862, No. 34,183.

In Testimony Whereof, I, A. M. Stout, acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this twenty-first day of March, in the year of our Lord one thousand eight hundred and sixty-seven, and of the Independence of the United States the ninety-first.

A. M. STOUT,

[L. S.] *Acting Commissioner.*

No. 34,183.

THE UNITED STATES OF AMERICA

To all to whom these Letters Patent shall come:

WHEREAS, J. H. Linville, of Altoona, Pennsylvania, has alleged that he has invented a new and useful improvement in iron truss bridges, (he having assigned his right, title and interest in said improvement to himself and J. L. Piper, of same place,) which he states has not been known or used before his application; has made oath that he is a citizen of the United States; that he does verily believe that he is the original and first inventor or discoverer of the said improvement, and that the same hath not, to the best of his knowledge and belief, been previously known or used; has paid into the TREASURY OF THE UNITED STATES the sum of thirty-five dollars, and presented a petition to the COMMISSIONER OF PATENTS, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose:

THESE ARE THEREFORE to grant, according to law, to the said J. H. Linville and J. L. Piper, their heirs, administrators or assigns, for the term of seventeen years from the fourteenth day of January, one thousand eight hundred and sixty-two, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement, a description whereof is given in the words of the said J. H. Linville in the schedule hereunto annexed, and is made a part of these presents.

In Testimony Whereof, I have caused these letters to be made patent, and the seal of the PATENT OFFICE has been hereunto affixed.

[L. S.] Given under my hand, at the CITY OF WASHINGTON, this fourteenth day of January, in the year of our Lord one thousand eight hundred and sixty-two, and of the Independence of the United States of America the eighty-sixth.

CALEB B. SMITH,
Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.

D. P. HOLLOWAY,
Commissioner of Patents.

THE SCHEDULE REFERRED TO IN THESE LETTERS PATENT, AND MAKING PART OF THE SAME.

To all whom it may concern:

BE IT KNOWN that I, J. H. Linville, of Altoona, in the county of Blair and State of Pennsylvania, have invented a new and useful improvement in iron truss bridges, and I do hereby declare that the following is a full, clear and exact description of the same, reference being had to the accompanying drawings forming part of this specification, in which

Figure 1 is a side elevation of two panels of a truss bridge constructed according to my invention.

Figure 2 is a transverse vertical section of the same.

Figure 3 is a plan of the top chords and lateral braces.

Figure 4 is a plan of the bottom chords and lateral braces.

Figure 5 is a horizontal section of one of the posts.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists—1st, in a novel construction of the lower chords and mode of applying the same in combination with the posts and other parts of the truss; 2d, in a novel construction of the posts of wrought and cast iron. To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation. O A L, O A L, are the posts; B B, the sections of the top chords; C C, the sections of the bottom chords; D D, the diagonal tension-braces or suspension-rods; E E, counter diagonal tension-braces; F F, lateral struts between the top chords; G G, lateral diagonal tension-braces between said chords; I I, transverse struts between the lower chords and lower ends of the posts; H H,

lateral diagonal tension-braces between the lower chords and lower ends of the posts; B^1 B^1, floor-beams; C^1 C^1, longitudinal timbers supporting tracks.

The bottom chords C C are each composed of a series of wide, thin eye-bars of wrought iron, of a length corresponding with the distances between the posts on one side of the truss, placed on edge to enable them to give vertical support to the roadway, and fitted outside of the bases L L of the posts, and between ribs S S formed on the said bases, as shown in figures 2 and 4.

The bars C are extended in width at their ends, and drilled to receive connecting-pins P P, one at the base of each post; the said pins passing through the said ribs S S, and being supported by the suspension-bars D D, which, as well as the counter-diagonals E E, are also fitted between other and similar ribs S S—the lower ends of the said bars being made with eyes for the reception of the said pins. The said chords, the ribs S S, and the diagonal rods D D and E, are so disposed or distributed as to obviate all danger of bending the connecting-pins P P, which can only yield by being sheared off by the tensile strain on the chords and diagonals; and the chords being thus well supported at short intervals, support the floor-beams and track without the employment of auxiliary beams for this purpose. The principal portions A A of the posts O A L, O A L, each consist of two rolled plates of wrought iron a a, (see figures 2 and 5,) of semi-octagonal or other semi-polygonal form in their transverse section, secured together at intervals by rivets J J, or by bands shrunk around them, binding them firmly to the filling or distance-pieces b, which are placed between them at suitable distances apart. The said plates a a are close together at top and bottom, but sprung apart at the middle of their length, to render them capable of resisting a greater compressive force, and to allow the diagonal counter-braces E E to pass through the posts without cutting away any of the material. The posts are completed by casting around the wrought-iron portion A the bases L and capitals O, of any desired shape. The wrought-iron portion A may also be constructed of two semi-circular T or L-shaped sections, sprung apart, connected together and terminating in cast bases and capitals in a manner similar to the two semi-polygonal pieces a a. The advantage of this construction of the posts, besides that of allowing the counter-braces to pass through them without their being weakened by cutting away the

metal, is, that they are more flexible than cast-iron posts, and less liable to injury by shocks.

The upper chords B B are made of cast iron, in sections of a length equal to the distances between the centres of the posts—said sections having the central portions made of octagonal or other polygonal or circular form in their transverse section, and terminating in rectangular form, with mid-ribs R R (see figure 2) at their ends, which abut together over the posts, to resist the vertical crushing strain resulting from the action of the diagonals, and afford a greater abutting surface to resist and distribute the horizontal compression of the top chord. These mid-ribs and the outside plate of the chord pass through guides e e on the top plates of the posts, and are thus maintained in line and position. The unusual width given to the abutting ends of the sections of the top chords increases the lateral stiffness of the chords, and allows the tension-rods D D in double-canceled trusses to pass outside of the posts, and at sufficient distance apart to admit of screws and nuts on the ends of the said rods for the purpose of adjustment. The several sections of the top chords may be formed of wrought iron, with cast-iron ends, in the same manner as the posts O A L, O A L. M M are angle-blocks placed over the joints of the sections of the top chord, and between guide-pieces d d provided thereon, to form bearings for the nuts f f, which are fitted to the screws of the said rods.

The upper lateral struts F F, of cast iron, rest in pockets or bearings in the sides of the top chords. The lateral rods G G pass through the chords, and are tightened by nuts K K, turning against angle-bosses Z Z on the outsides of the chords. When the bridge consists of three trusses, the bosses Z Z are used on both sides of the chords of the centre truss, as shown at the right-hand side of figure 3—a jam-nut being used at one side of the truss, and a sleeve-nut V on the other side, for the two-fold purpose of adjusting the lateral rod Y of the third truss, in such manner that the two systems of lateral bracing may act independently of each other, which is an advantage in the raising of the bridge, and also in its subsequent use. Besides this advantage, it—this system of bracing—obviates the necessity of passing all the rods through the chords. The lower lateral tension-braces H H consist of short rods connected (as shown in figure 4) midway between the two trusses, with a ring A^1, and also connected with plates N N, through which the connect-

ing-pins P P of the lower chords pass—the said plates being interposed between the lower chords and the ends of the cast-iron struts I I, and being secured to the lower chords and bosses of the posts by means of the nuts on the outer ends of the said pins P P. The said rods may be either tapped into the ends of the plates N N as represented, or attached by eyes. The lateral struts have each a concave opening in the lower parts of their ends to drop over the connecting-pin, and they should bear upon the plates N N. These plates transmit the strain from the rods H H to the struts I I, without straining the ribs S S of the bases of the posts.

1862
1st claim

I do not claim the use of eye-bars or links as chains of suspension bridges, or as tension-braces of truss bridges: but what I claim as my invention, and desire to secure by letters patent, is—1st, the construction of the lower chords of truss bridges of series of wide and thin drilled eye-bars C C, applied on edge between ribs S S, on the bottoms of the posts, and connected by pins P P, supported in the diagonal tension-braces D D and E, all substantially as herein described; 2d, the posts O A L, O A L, composed each of two wrought-iron plates or bars a a, distance-pieces b b, and rivets J J, or their equivalents, and cast-iron bases L L, and capitals O O, the whole combined as herein specified.

J. H. LINVILLE.

Witnesses:
W. B. WILSON,
JOS. M. WILSON.

Summary.

I.

Appellant proves by *no witness* that appellee has infringed claim 3 of the patent of 1862, by showing—

1. That any eye-bar made by appellee was ever *actually used* in any bridge.

2. That any eye-bar made by appellee was "wide and thin."

3. That any eye-bar made by appellee was even *intended to be used* as a support for a flooring in a bridge, or was ever so used.

4. That any eye-bar made by appellee was ever *intended* to be used, or was ever used, "in a series of wide and thin drilled eye-bars, applied on edge between ribs on the bottom of the post, and *connected by pins supported in the diagonal tension braces, all* substantially as described."

It will be observed that, as to the 3d claim of the patent of 1862, no witness pretends to prove that either appellee, or any one else, *has done* anything that is described in said patent and specified in said 3d claim, but that a bridge company *intends* to do something which will infringe.

There is no model, drawing, or description of the Lasalle bridge as constructed, or *intended* to be constructed, proved.

Appellant places much stress in his brief upon the point that the court are to give force to these words of the claim, viz., "eye-bars applied on edge, *between ribs on the bottom of the post;*" but he wholly omits to ask the court to give force to these other words, equally forcible in said claim, to wit., "*and connected by pins supported in the diagonal tension braces, all* substantially as described."

It does not appear that Mr. Linville saw such a diagonal brace, or appellees ever made one, or that said Lasalle bridge had, or was *even intended* to have, *such diagonal braces* and mode of attachment by pins, *in* connection with the round-bodied eye-bars.

II.

AS TO PATENT OF 1865.

Appellant proves by no witness that "wide and thin" eye-bars were ever made by upsetting or end compression into a mould of the desired shape by appellees.

Appellant proves by no witness that any eye-bar of any kind which appellees made was ever used in a bridge.

Appellant fails wholly to establish any connection between appellee and any bridge builder, except that of mere manufacturers of iron.

The disclaimer in the patent of 1865 distinctly concedes the manufacturer's right to *make* eye-bars by end compression into a mould.